ACORN·USER

BBC MICRO · ELECTRON · ATOM

JULY 1984 £1

In depth:
how Plus 1 aids Electron upgrade

New users:
First Byte helps you get started

At last:
a first-class database ROM

Programs:
16 pages of fun and learning

Business:
Z80 software under the microscope

Schools:
setting up a viewdata system

Looking to the Future of Communications

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Keep on that economic line between over and under feeding!

Save time recording milk yield and calculating feed amounts!

Quickly decide feeding policy with the 'Monthly Calving Group' Performance Graph!

Print out a recording sheet with cows in numerical order. Print out graphs or tables of individual cows or Monthly Groups showing serving and pregnancy details, illness record, Calving Index, weekly and running total Margin over Concentrate. See at a glance cows due for serving, pregnancy diagnosis and drying off. Keep track of weekly total feed cost and milk sale price.

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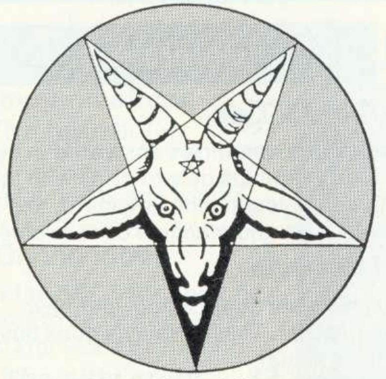
Predict cow or Monthly Group total lactation yield. Compare with Standard Lactation Curves. All old data preserved – compare Monthly Groups over the years. Which is the most profitable month?

Find out with DAIRYFILE – for up to 200 lactating cows.

£69.00 inc. VAT (disc only).

2 × 40 Track Drives Required or 1 or more 80 Track Drives. Please state which when ordering.

SATAN'S CHALLENGE or (Nevil Rides Out)



A Black Magic Adventure

Dare you take up the challenge laid down by the most evil and sinister of all beings . . . the devil himself.
If you do you will find yourself alone and at the mercy of the twisted fancies and whims of a cold and calculating mind.
Occult forces are threatening the lives of those near and dear to you. Their only salvation rests in your hands but in accepting the challenge your own existence is put in severe peril.
In taking up the challenge you have to find The TALISMAN and locate a pentagram which then has to be prepared for the final rite. In the meantime dark forces will be opposing you making a difficult task almost impossible.
Do not allow yourself to be lulled into a sense of security for it will be short lived.
Many have gone before only to swell the ranks of the damned.
This is the latest adventure from the stables of Microtest and has been written with the acclaimed features of other adventures in mind eg save facility, quick response, simple but extensive commands, a mixture of logical and friendish problems to solve.
Be warned this is an easy adventure to get into but devilishly difficult to end.
"Destined to become a classic in its own right." CN

Cassette £7.95 inc. VAT **Disc 9.45 inc. VAT**
Disc 40 or 80 Track.

MICROTEST FONT ROM.

This exciting new ROM from Microtest will enable you to get all sorts of new characters and fonts from your BBC Computer. Once you have produced your masterpiece on the screen, all you have to do is use the inbuilt screen-dump utility to produce a hard copy on to paper.

Typing '*HELP FONTS' gives a list of available fonts and the blocks of characters which they replace.

Available fonts are:

***Accents**	Accents and miscellaneous.
***Block**	Small capitals.
***Data**	Like the bottoms of cheques.
***Greek**	It's all Greek to me too!
***Joined**	Standard capitals with joined up lower case.
***Maths**	A mix of until now unobtainable Mathematical symbols.
***Miscellaneous**	A few oddities which often are very necessary.
***Thick**	Thick text (for MODEs 0&3) to enhance 80 column mode.
***Thin**	Thin text (for MODEs 2&5) which makes modes 2 & 5 much more readable or perhaps "READABLE".
***Vertical**	For labelling graphs.

The ROM has a dump facility which will produce a screen dump of any MODE for 0 to 6 on an Epson, Star printer, CTI CP80 or MT80.

The ROM uses absolutely NO user memory and can be used with word processors etc. as well as normal BASIC programs.

£17.50 inc. VAT

Microtest Starstick ROM & Joystick Package

Now available the Starstick ROM and Joystick. This comes in three forms:



(A) The Starstick ROM and Quickshot I Joystick
Price 17.95 + VAT = 19.84

(B) The Starstick ROM and Quickshot II Joystick
Price 19.25 + VAT = 22.14

(C) The Starstick ROM and patch lead, choose your own Spectrum/Atari style joystick
Price 15.25 + VAT = 17.54

Post and Packing £1.00 inc. VAT per item

This enables you to plug the Rapid action self centring joysticks until now only available for the Spectrum/Atari/CBM machines into the user port of the BBC. Model A users please note NO ANALOGUE INTERFACE REQUIRED.

Disc Users Note – pressing BREAK, SHIFT-BREAK or CONTROL BREAK does not modify or destroy the STARSTICK software so Disc Users please feel free to Boot!

The software patch provided in the ROM is interrupt driven and adds the following commands to your computer.

Enables you to use our joysticks even on programs that do not offer joystick capability.



- ★ STICK turn on the STARSTICK ROM
- ★ NSTICK turn off the STARSTICK ROM
- ★ SETSTICK set up joystick to users spec
- ★ SAVE "NAME" 140 160 saves your user-key protocols
- ★ ADVAL emulate standard analogue joysticks
- ★ PAUSE define key to Freeze game
- ★ NPAUSE turn off ability to freeze game
- ★ "NAME" predefined key protocols set up for software houses programs
- ★ HELP KEYS displays currently selected key protocols
- ★ REPEAT enables auto-repeat fire
- ★ NREPEAT disables auto-repeat fire

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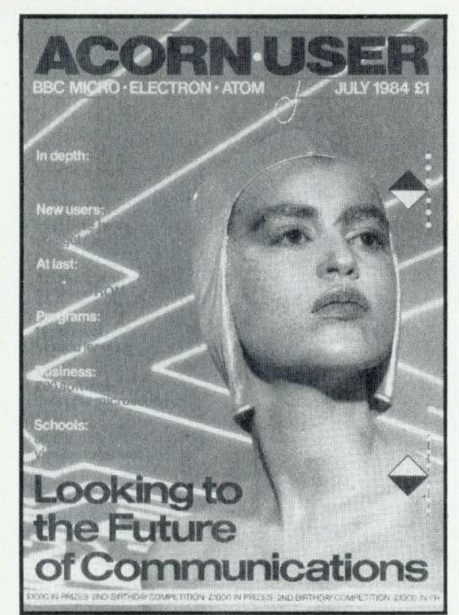
Telephone: 0208 3812

OR ANY GOOD DEALER

VISA



Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE



THE ONE AND ONLY BBC, ELECTRON AND ATOM MAGAZINE

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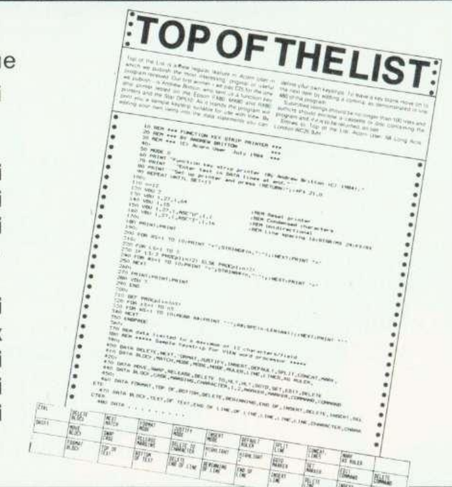
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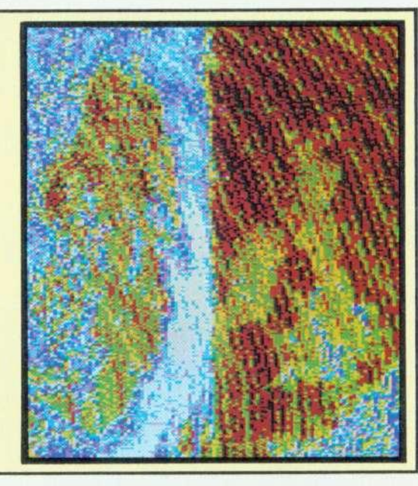
FRAYED FINGERS? FRAYED TEMPER?

Save yourself the bother with the Acorn User cassette of all the listings in this issue! See page 177 for order form.

NEXT MONTH. . .

Downloading the weather

Satellite pictures of Europe on a BBC micro! Robin Mudge reports on how it's done

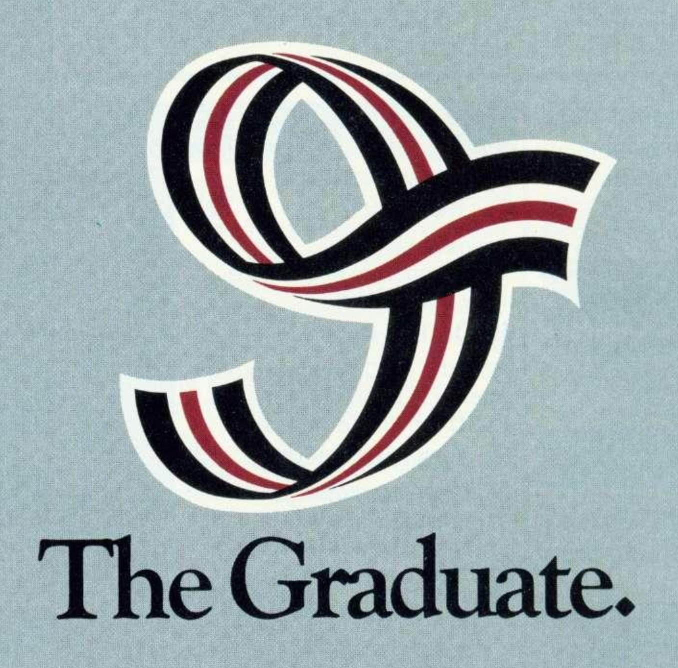


Keeping the kids busy

Joe Telford presents his ideas on occupying the little ones during the summer

Hints, tips and first bytes

Correcting listings, adding a second disc drive, Wordwise aids, coloured listings, using the keyboards . . . all this and much more



The Graduate.

The first IBM P.C. compatible upgrade for the BBC model B micro.



THE ITV computer series *Me & My Micro*, which aims to teach Basic programming on a Sunday morning, has made copies of the listings featured in the series available to viewers.

The programmes feature the Electron, and so all the software should run on the BBC micro. Comments on the routines are included, and 'souped-up' versions of the games.

To receive the support material, send an sae to: *Me & My Micro*, Admail 1, Leeds LS3 1YS.

Medical package is fit for Beeb

A BBC micro-based system has been developed for GPs by Abies Infomatics.

The Abies package uses a 6809 second processor with 64k RAM to store patients' records and is supplied complete with software.

Abies software has been available for mainframe computers for several years, and with the help of Cambridge Microcomputer Systems Abies has adapted the software to run on the Beeb.

Further details: 01-994 6477.

Acorn dispels superchip doubt

THE 16032 second processor from Acorn looks unlikely to appear before the end of the year, but the project is definitely going ahead.

Rumours in Cambridge earlier this year suggested that Acorn might drop the 32-bit 'superchip' which is the final part of the BBC system.

Speculation was enhanced by stories in the computer Press that National Semiconductor, which makes the chips, was having trouble getting them to run at 10MHz, the speed Acorn was reported to want.

However, a high-ranking source within Acorn has denied the rumours and said: 'We are definitely in a go state on this product.' He would not elaborate, or give any details on the timing, price or specification of the system.

Prototypes have been housed in the standard second processor box with $\frac{1}{4}$Mbyte of memory provided by 64k RAMs. This is the minimum memory required to run the operating system Unix (or Xenix, as the micro version is called), but the memory size could be increased by using the latest 256k memory chips.

A spokesman for National said the 16032 chips were available running at 8MHz, but that it would take time to get them up to 10MHz. 'We have customers doing things with 8MHz chips. It depends what Acorn wants to do.'

It has taken about five months to increase the chip speed from 6 to 8MHz, but the company could not give a precise date for the 10MHz version. 'It could be two, three or five months. It could be earlier, it could be later.'

The 16032 actually consists of five chips, two of which are giving the problems.

Once Acorn has decided to accept the chip set, Logica is confident there will be no delay in implementing Xenix.

● As this issue went to press it was announced that the 16032 has been rechristened as the 32016 by National.

TV fame for school winners

A SPECIAL one-hour micro show will go out live from BBC TV on Sunday June 24 to announce the results of the BBC's schools competition – and it will herald the start of a new magazine programme.

The live show follows the success of the first *Micro Live Special*, which brought in an audience of a million people on a Sunday morning. All 15 regional winners of the competition will be in the studio, with the final results made in the traditional 3,2,1 style.

The new magazine series will be monthly and will start in October. Some of it will be recorded, and some will go out live, depending on studio demand.

Meet authors at the Acorn User Show

ACORN USER authors will be holding a special clinic to help readers with their problems at this year's Acorn User Exhibition in August.

Other special attractions will be displays on education and robotics, with the MEP (Microelectronics Education Programme) showing a touch-screen add-on for the BBC micro.

This year's Exhibition will be held in Olympia. It opens with a trade-only day on August 16, through till Sunday August 19.

Several companies will be exhibiting in what Tim Collins, the organiser, has tentatively named 'Robot Road', showing what to interface to your micro.

Information from Tim Collins at Computer Marketplace, 20 Orange Street, London WC2H 7ED.

BBCSoft's Electron push

BBCSoft will produce Electron versions of its games starting in the autumn – and make software spin-offs from educational TV and radio programmes available to the trade.

Software manager David Atherton explained: 'We are going to do versions for the Electron, starting with *White Knight 11* in the autumn.

'From then on, everything will go to the Electron, apart from disc-only programs, or those which just won't run.

'*Waves* will be the first in a series of 10 packages from *Science Topics*, all going to the trade.'

Four releases set for September are: *Gamescore*, which provides routines for building your own strategy board games; *Drawstick*, a graphics painting program; *Wordmover*, a simple text editor aimed at education; and *Astronomy*, a set of graphics demonstrations on the moon, eclipses and planetary motion, and a moon lander-type game.



Fred Harris on BBC and ITV

The fifth is *Using Your Computer* – a spin-off from schools radio broadcasting. It is aimed to give children aged 8–11 an introduction to micros. At £29.95 it sounds expensive, but includes a book, audio tapes and 12 programs on cassette. Fred Harris, currently fronting Yorkshire TV's *Me and My Micro* series, did the voice recordings and put the package together.

Nearer Christmas, the packs from the *Science Topics* TV series will appear. First will be *Waves*, featuring physics experiments based on ripple tanks, followed by other software, which will be available only on disc.

25 BBC MICROS TO BE WON!



WALL'S ICE CREAM AND ACORN COMPUTER INVITE SCHOOLS TO DEVISE A COMPUTER GAME

Here's a great chance to win one of 25 BBC Microcomputers (B) for your school.

To celebrate the launch of the new MegaBytes lolly, Wall's and Acorn are offering these superb micros free to winners of this 'Mega' competition.

The competition is open to all UK primary, secondary and special schools.

To enter, each school team must:

1. Devise a computer game program which features ice lollies and;
2. List as many words as possible using letters from the phrase: 'Wall's and Acorn'.

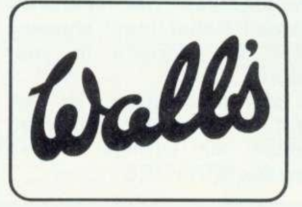
There is no limit to the number of entries per school but each entry must be accompanied by fifteen MegaBytes lolly wrappers and arrive by 28 July 1984 at MegaBytes, PO Box 4XZ, LONDON W1A 4XZ.

Entries will be judged by a young computer games author and a team of professional programmers from Acornsoft. Points will be awarded for originality; quality of graphics; speed; sound effects; playability and overall presentation with attention to detail.

To win a computer, your school entry must have a high scoring game program and a sufficient number of words.

FULL RULES

1. Entries can be submitted on cassette or disk and written in either BBC Basic or machine code, each entry being signed by the teacher of computer studies or head teacher of the school. Entries should run on a BBC Microcomputer Model B or Acorn Electron.
2. All games must be clearly identified and accompanied by a full printed listing as well as a games catalogue style description of the game (not more than 200 words). The cassette/disk and listing should each carry the entrant's name and address.
3. Each school may only win one prize, irrespective of the number of entries of games submitted. Entries will be acknowledged upon receipt but not returned. Correspondence will be entered into at the absolute discretion of the promoters.
4. The entry instructions constitute part of the competition rules and are binding upon entry.
5. Responsibility cannot be accepted for entries lost, damaged or delayed in transit to the competition address. Illegible or altered entries will be disqualified, as will those not conforming to the entry instructions.
6. Entries will be judged by a panel of judges which will contain at least one independent member not connected with the promoter. The decision of the judges will be final and legally binding and in all respects of the competition the decision of Birds Eye Wall's Limited shall be final.
7. Copyright in all material entered rests in Paragon Communications on behalf of Birds Eye Wall's Ltd., and Acornsoft Ltd.
8. Winning schools will be notified as soon as possible after the closing date. A list of winners will be sent to anyone who encloses a stamped addressed envelope with their competition entry.
9. Entry is open to all qualifying UK residents except for employees of Birds Eye Wall's and Acorn Computer, their advertising and promotion agencies, or anyone directly connected with the competition or their families.







Radio cell option for micros

TO KEEP abreast of developments in the communications world the Editor and I made our way to the National Exhibition Centre in Birmingham where the electronics industry had gathered for Communications '84.

Several manufacturers were previewing their cellular radio systems which allow telephone subscribers to move about the country and have calls routed to them automatically.

This is accomplished

Communications 84

by dividing the country into a number of hexagonal cells, each of which contains a radio transmitter/receiver.

Racal, one of the leaders in this area, was also displaying the new Epson PX8 portable computer which brief interrogation revealed as a statement of their intention to upgrade the cellular system to allow computer data transmission.

British Telecom had the Healthnet terminal on show. This is an Electron with a custom-made expansion box, and it is intended for use where a lot of form-filling is done at many separate sites. Very little technical information was available beyond what was in last month's *Acorn User*.

Thorn-EMI had a rather flash little package containing both a 1200/75 modem and terminal software for the Beeb, intended to sell for about £140. Dealers are being sought now.

The Epson PX8 portable mentioned earlier has some beautiful ergonomic touches such as fold-out legs for tilting up the back and a fold-up liquid crystal display. It runs CP/M from tape cassettes with an optional 80k RAM-disc which bolts neatly on the bottom. Tandy watch out! *Alex van Someren*

Chip camera for Beeb – a 'Snap' at £130



by Bruce Smith

THE makers of the Beasty, Commotion, are set to release an add-on 'eye' for the Beeb. The £130 EV1, also known as Snap, is a chip-based video camera which plugs into the user port to produce a black and white picture on a mode 4 screen.

The EV1, pictured above, is about the size of a cassette case and uses a standard lens supplied with the miniature Pentax 110 SLR camera. A 64k light sensitive RAM chip acts as the camera's 'film', though only 32k of this is actually used to produce the picture.

The chip itself has had its protective case sliced off so that its silicon base is exposed to light. The picture is converted into a digital form and fed into the Beeb's user port.

The picture is formed on the lower half of the screen and has a resolution of 128 pixels vertically by 256 pixels horizontally. Using suitable software a panoramic full-screen picture is possible.

The software to produce the picture sits in 2k of memory below Himem and is written in machine code. Also supplied with the EV1 is software to evaluate shapes. The camera produces an outline image of any objects in its field of view and then calculates their area, parameter and centre of gravity. Using this information programs can be written to enable the Beeb to recognise certain objects by comparing them with pre-programmed information.

Also available from Commotion is the Beasty Arm at £32.95 (without servos). This robot arm can be supplied as a standard kit of parts or as a pick-and-mix set of modular parts. The arm consists of lengths of square section aluminium which fit into plastic housings. The Arm is interfaced to the user port via a Beasty (see Paul Beverley's review in May's *Acorn User*).

Software supplied with the arm allows the user to program a sequence of movements into the arm by editing them, as in a wordprocessor, into the main program. The arm will be supplied in kit form.

The EV1 and Beasty Arm will be available in the summer from Commotion at 241 Green St, Enfield, London EN3 7SJ.

Coming soon: Z80 software in quantity

BUSINESS software for the BBC micro Z80 second processor is soon to be available in quantity from major UK distributor Software Limited.

Typical packages include the well-known *Wordstar* wordprocessor, *dBaseII* database manager, *Supercalc* and nearly 300 others. Prices are the same as for versions to run on other machines, eg *Wordstar* for £295, *dBaseII* for £438.

Software Limited have done all the necessary work, known as configuration, to allow the packages to be used as soon as you receive them. This involves providing the software on correctly formatted discs and alterations to allow use of the function keys on the BBC to replace the control-code combinations found on other micros.

Dealers will be provided with software by 24-hour Securicor delivery, and Software Limited will be providing them with a telephone technical enquiry service. Under a contract with Software Limited, Acorn gave the company early access to the Z80.

Software Limited's marketing head Aidan Shackleton said: 'We believe that this contract with Acorn shows the way for future software distribution and co-operation between the hardware and software supplier.'

Shackleton also said preparations were being made to meet 'a huge demand' from users of CP/M on the BBC.

Dealers can contact Software Limited on 01-833 2601.

Service deal set up by Acorn

KODE Services will provide on-site maintenance of all Acorn equipment within eight working hours.

Kode is claimed to be one of the country's largest maintenance contractors with engineers at six sites in the UK. Acorn's Customer Service Manager Mike Bicknell said: 'It's time Acorn provided the same servicing options to its major customers as other large computer manufacturers do'.

Kode contracts will not affect the normal Acorn guarantees. Non-dealer warranty repairs will still be taken care of by Retail Control Systems, Feltham, Middlesex.

Further details from Kode Services on (0249) 813771.

GREMLINS HIT JUNE LISTING

THE GREMLINS have lost the end of a line of one of Paul Beverley's listings in last month's issue (yellow page vii, listing 2). Line 140 should read as printed below. Apologies to readers.

```
140 IF (?M% AND T%) > 0 THEN VDU255 ELSE VDU32
```

Torch carries on with 'conflicting' products

TORCH is pushing ahead with its expansion plans despite being bought up by Acorn last month – and it looks set to continue giving its new parent a run for its money.

Neither company has announced any product cutbacks, and both appear to be carrying on as before. Vague proposals have been made for each to support the other's product ranges, but no definite decisions have been taken.

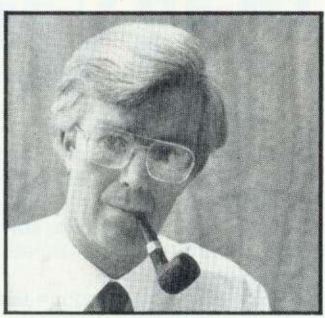
Several areas are set for conflict, however, the most immediate being the Z80 second processors. Torch had already sold about 6000 of its Z80 disc packs before Acorn's Z80 second processor was launched last month. Now it has made the Z80 card available separately for £263, which includes the Perfect range of CP/M-compatible software, undercutting the £299 offering from Acorn.

Another area of conflict is networking. Torch has Torchnet, an expansion of Acorn's Econet, while the parent also has involvement in two other networks.

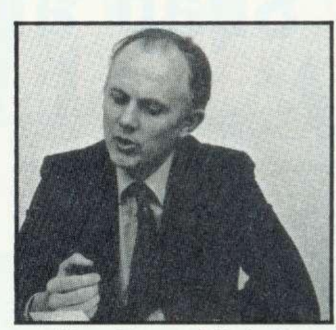
But the big crunch is likely to come in the autumn with the launch of Acorn's business machine – or, more probably, machines. Both companies will then be supporting mainstream business systems, probably with similar specifications.

Torch already has its Winchester discs running (Acorn's are undergoing field trials), and a 68000 second processor, giving 32-bit processing (Acorn's equivalent to the 16032 is still not up to scratch).

The two companies have long had close ties. At one time they shared offices and Torch was to be the business arm of Acorn. The two disagreed over policy and formal links were severed about two years ago – except one, that is: Acorn was contracted to supply Torch with BBC boards for its own range of computer products.



'The two companies have an exceptionally high degree of compatibility in products, in strategic thinking and in management style. We believe this new grouping will become a major British entry into the world market for communicating business systems' – Bob Gilkes, Torch chairman



'Torch's established position in business systems is a natural outlet for some of Acorn's own business systems products, and a rationalisation of the two companies' development efforts will give a substantial boost to both Acorn's and Torch's market prospects' – Alex Reid, Acorn director

Summer class for teachers

MUSE is to hold its annual summer course on computers in education at Nottingham University in July (23–25). Main speakers include John Coll of the MEP and Dr Max Bramer of the Open University.

There will be sessions on structured programming, BBC assembler, music, Logo, networking the Beeb and evaluating software.

The residential cost for the three days is £57.50, with a supplement of £11.50 for non-members. Details: MUSE, PO Box 43, Hull HU1 2HD.

Beeb 'n' board

OCTOPUS is again running its BBC-based computer courses in the summer holidays. Each is made up of five half-day sessions, costing £40.25 or £150 full-board.

Details from Octopus, St Joseph's Hall, Junction Rd, Oxford OX4 2UJ.

Legal entry

FOLLOWING the threat of legal action by Acornsoft over Silversoft's database, *Viewbase*, Silversoft has renamed its product *Index*.

Index, which costs £24.99, now embodies an enhancement which makes it possible to create a file, enter data and alter the file structure without corrupting data.

Unicorn upgrades

TORCH has set out to tempt BBC owners along the upgrade path with a range of products under the 'Unicorn' banner – from a communications package to Winchester discs.

Unicorn kicks off the range at £185. It provides a BT-approved modem (OEL's Telemod) and software to access electronic mail and Prestel, as well as a mainframe link.

Next comes the Z80 second processor at £263, including bundled software, and the twin floppy disc pack combined with the Z80 disc pack at £699. Then come the two heavyweights.

First is the HDP240, a 20Mb hard disc pack. This also includes a 400k floppy disc drive and can be connected direct to a BBC or via a network. A drive controller is included in the price of £1995.

Finally, there's the HDP68K, a hard disc pack with 68000 and Z80 processors built in. The 68000 chip handles 32-bit processing internally, but takes data in 16-bit chunks. This is the same chip as used in Sinclair's QL. Included in the box is a 400k floppy drive and 256k RAM.

Torch has implemented the Unix operating system on the 68000 and others are coming.

The 8088 chip, as used in the IBM PC, is already available in the Torch computer range, and so this is a likely contender as the next add-on processor for the BBC.



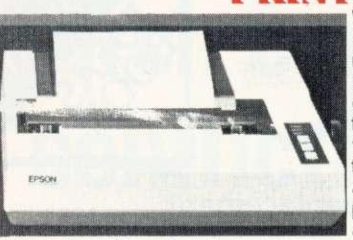
LION'S SHARE – Lion Microcomputers is giving away £20,000 worth of computing prizes during an Acorn Week at its Tottenham Court Road microcomputer centre in London on July 9-15. The event is being co-sponsored by Acorn and Mirrorsoft, the Daily Mirror's software division. Among the exhibitors will be Software Ltd, demonstrating a range of CP/M software, Microware with new drives and Microvitec. Admission is by ticket.

TECHNOMATIC

BBC Computer & Econet Referral Centre

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PRINTERS



We have a range of printers that will meet most requirements. **EPSON**—the high quality dot-matrix printers that set the standard in the industry—versatile printers that provide the optimum in performance & reliability. The RX80/FT provides all standard printing & graphic functions, (single sheets & perforated paper), with the de-luxe FX80 giving in addition proportional printing, italics, programmable characters etc. The FX100 also allows the use of 15" wide paper.

Epson DX100 – a new daisy wheel has the hallmark of Epson's quality performance and reliability. The **JUKI** daisywheel provides a quality normally found in printers costing far more. Printer cables, interfaces, ribbons, paper etc. are all normally available from stock.

6502 2nd Processor & Bit Stick now in stock.

TORCH Z80 DISC PACK

The proven upgrade for the BBC Micro. Comprising 2 x 400K disc drive, Z80 processor with 64K of memory, and a CP/M compatible operating system, it opens up the vast range of CP/M software, including advanced languages, scientific and business applications. The system is supplied complete with the PERFECT software range including PERFECT WRITER, PERFECT SPELLER, PERFECT CALC, and PERFECT FILE. Full TORCHNET software is also supplied allowing sophisticated networking between other units. This will allow access to information, and communication, between up to 254 suitably upgraded BBCs.

NEW TORCH Z80 PACK PRICE £699.
SOFTWARE PACKAGE INCLUDES Z80 BASIC

Phone for details about the 20Mbyte Hard Disc Pack, and the 68000 Hard Disc Pack with UNIX Operating System.

NOW AVAILABLE – The TORCH Z80 SECOND PROCESSOR CARD – for those who already have suitable disc drives. The card is supplied with all the free perfect software and Z80 basic, as detailed above, presenting a very attractive package. **£299.**
Torch ZHD240 Mbyte Hard Disc + 400K Floppy. **£1,995**(a).

RH LIGHTPEN

The Acorn-approved superior design, with a programmable 'push-tip' switch, status indicator LED and an interface box. Supplied complete with manual, full software and basic demo programs. **£39**(c). Demo program on disc **£7**(d). Colour graphics. Cassette **£8.65**(d) Disc **£10**(d).

MICROTEXT

Developed by the National Physical Laboratory, is a program-ming system designed to simplify the production of a wide range of man-computer dialogues. Using MICROTEXT, an expert in any field can construct their own complete courses of computer-based instructional material. Applications include interviewing systems, teaching packages, training courses and interactive demonstrations and simulation. Cassette **£43.35**(c) Disc **£52**(c).

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A low cost graphic-tablet offering the performance and durability required for the business, industrial and educational user. It is small, accurate & reliable. Working area: 240 x 192mm + Menu area. **£125 plus CAD program. £125**(b).

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Converts your BBC into a fully fledged Teletext Terminal. In addition to normal reception of Teletext pages, it is able to 'download' software as well as saving standard pages on any of the four TV channels. **£196.**

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This long awaited range brings professional business software to the sma business user at a budget price. Available on disc only, using genuine 'randon access', each package can, if required, be linked together to provide a totall integrated business system. Modules comprise Invoicing, Order Processing Stock Control, Accounts Receivable, Accounts Payable, Purchasing, Mailing System. Each package **£22.65**(d).

MONITORS:

NEW LOW PRICES

MICROVITEC—a range of British Made DTI/ACORN approved Std/Med/Hi-resolution RGB colour monitors that have a consistent, reliable performance. Also available in RGB PAL/SOUND versions. The KAGA range provides a similar performance in 12' screen format. Our Japanese manufactured Hi-Res green screen **SANYO** is ar ideal solution for high clarity 80 column text display. The **KAGA** green screen with its 'chemically etched' anti-glare screen for the discerning user. Al monitors are supplied with suitable leads at no extra charge.

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This is a full specification, direct connect modem, with both Originate & Answe modes, allowing access to the many databases, bulletin boards, as well a inter-computer communication. The modem conforms to the internationa CCITT V21 300/300 Baud standard. (NOTE: Not suitable for PRESTEL). Having full BT Approval, it connects directly to the telephone line, for optimum performance. Being battery powered, it is totally portable (optional powe supply available). **£69.** BBC Lead **£3.50.** External PSU **£8.00**

TECHNOMATIC

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ULTRACALC

With advanced features, such as: *Handling of labels as well as numbers, as values, allowing the search of a list by a meaningful name, instead of just a number. *Efficient memory usage allowing large spreadsheets to be constructed. *Variable width columns. Facilities include SUM, Replicate & most mathematical functions. It helps you to create and manipulate *Budgets *Cash-Flow forecasts *Price Lists *Balance Sheets *Time Sheets *Order Entry *Small Databases *Scientific Calculations etc. **£65.**

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KENDA DMFS

A truly professional double density DMFS with several unique features:- *requires no RAM i.e. PAGE=&EOO *uses standard CP/M filenames & disc drive conventions *no limit to number of files *single/double density automatically selected *runs most 'protected' software *enables 80 Track drives to read 40 Track discs.

SCOTCH 3M FLOPPY DISCS

to advanced production techniques, a higher standard has now been reached, enabling Scotch to guarantee error free performance for life.

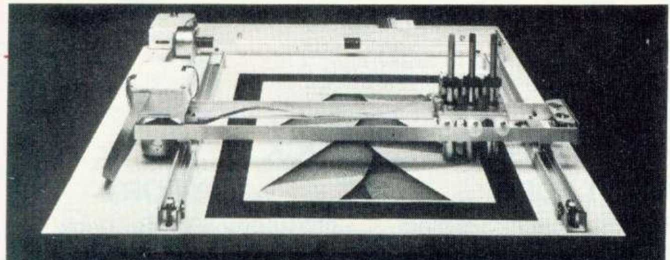
3" HITACHI DISC DRIVES

The latest in minature data-storage technology. Totally hardware & software compatable with 5¼" drives (can be used together!). Supplied complete with format disc, manual, cables etc. **£150**(b).

ACORN IEEE INTERFACE

A full implementation of the IEEE-488 standard, providing computer control of compatible scientific & technical equipment, at a lower price than other systems. Typical applications are in experimental work in academic and industrial laboratories. The interface can support a network of up to 14 other compatible devices, and would typically link several items of test equipment allowing them to run with the optimum of efficiency. The IEEE Filing System ROM is supplied. **£282.**

GRAPHICS PLOTTER/WORKSTATION



Equally at home in the artists studio, hobbyists workshop, science laboratory, classroom, and production floor, this system has something to offer everyone. The 3-colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025 cm. over an A4 area – the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic colour plotter carries three colour pens each of which is software selectable. Various add-ons greatly increase the versatility of the unit, while still retaining the unit's accuracy. The servo controlled drill/router, and a scriber enables drilling, cutting and scribing in various materials. A unique Opto Sensor (using a Hewlett Packard Device) turns the plotter into a high resolution scanning digitiser to read and store whole diagrams, for example, for use in map work. This unique versatile Workstation is supplied complete at **£490.** Basic Plotter **£270.**

Continued on page 14 →

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TECHNOMATIC LTD.

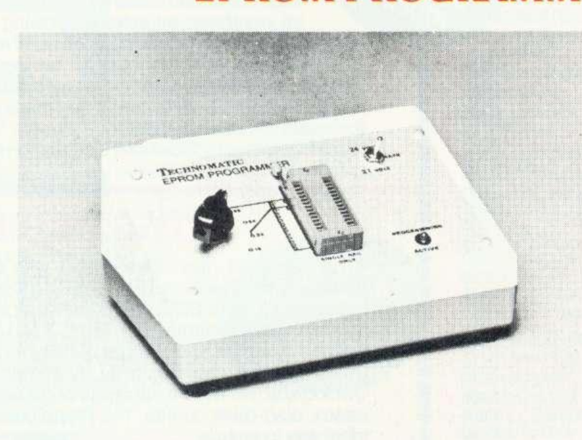
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The programmer comes complete with cables, software & operating manual.
£89 + £2.50 carriage. Software on disc £2 extra.

* Menu Driven Software provides user friendly options for programming the eprom with:
  - a) Basic programs.
  - b) Ram resident programs.
  - c) Any other program.
* Programmer can read, blank-check, program & verify at any address/addresses on the Eprom.
* Personality selection is simplified by a single rotary switch.
* Programming voltage selector switch.
* Full Editor with ASCII Disassembler, allowing direct modification of memory data in HEX or ASCII.
* Continuous display of time left for completion of programming.
* Continuous display of current addresses as they are being programmed.

EPROM ERASERS

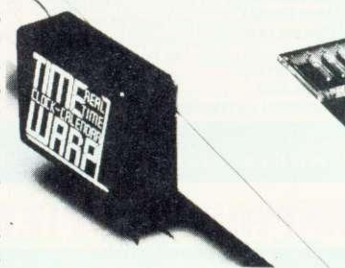


UV1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays.
It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59 + £2 p&p.**
UV1 as above but without the timer.
£47 + £2 p&p.

SPECIAL OFFER EPSON FX 80 PRINTER ONLY £325
including BBC printer lead
Twelve Months full warranty.
Offer valid while stocks last.

'TIME-WARP' REAL-TIME-CLOCK/CALENDAR

A low cost unit that opens up the total range of Real-Time applications. With its full battery backup, possibilities include an Electronic Diary, continuous display of 'on-screen' time and date information automatic document dating, precise timing & control in scientific applications, recreational use in games etc—its uses are endless and are simply limited by one's imagination. Simply plugs into the user port—no specialist installation required—No ROMS. Supplied with extensive applications software.
Please phone for details.
£29.00 + £2.50 carriage.



SMARTMOUTH:

The original 'infinite speech'. Still the best.
A ready built totally self contained speech synthesiser unit, attractively packaged with built-in speaker, AUX output socket etc.—no installation problems!
It allows the creation of any English word, with both ease and simplicity, while, at the same time being very economical in memory usage. You can easily add speech to most existing programs. Due to its remarkable infinite vocabulary, its uses spread throughout the whole spectrum of computer applications—these include industrial, commercial, educational, scientific, recreational etc.
No specialist installation—no need to open your computer, simply plugs into the user port—and due to the simple software, no ROMS are needed.
SMARTMOUTH is supplied with demo and development programs on cassette, and full software instructions. **£37+ £2.50 carriage.**





ELECTRON ADD ONS

NOW IN STOCK

PRINT PORT
* Suitable for most centronics printers
* Supplied complete with lead & programming.

£39 + £1.50 p&p

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* Controls over 80% of available arcade games.
* Uses ATARI Style 9 pin joysticks
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BEEBUGSOFT

A professional range of Firmware/Software to suit both the advanced programmer and the user. From the well known 'EXMON' and 'TOOLKIT' to the WORDWISE SPELLCHECK.

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All prices exclude carriage & VAT. Please add carriage as indicated and add 15% VAT to the total order value. For fast delivery telephone your order quoting VISA or Access card or official order number.
(Minimum telephone order £5).

Vikings and maths in learning games

A 'MATHEMAGICAL' adventure called simply *L* is the latest creation of the Association of Teachers of Mathematics.

L aims to provide the appeal of a computer adventure based on puzzles and questions, without resorting to blood and slaughter.

L is aimed at school and home. It is supplied on 40-track disc for £10 by ATM, Kings Chambers, Queen Street, Derby DE1 3DA.

Dial Software has released two educational items, *Child's Play Pack* and *Spellwell*. The former is aimed at young children and contains four programs combining colourful graphics and speech on machines that have a speech synthesiser fitted. The latter is a spelling drill for all age groups, with five levels and a dictionary that the teacher or parent can modify as the pupil's vocabulary increases.

Happy Writing from Bourne Educational runs on the BBC, Electron and, interestingly, the Amstrad CPC 464. It is designed to help children learn to write and combines animation, colour graphics and sound to keep the child's attention.

Fernleaf Software has a September launch planned for its *Viking England* package. This comprises four interlinked programs to be used as part of a larger history project by children aged 9–13.

The children need to organise a raid, make a landing, explore inland and eventually settle down and try to develop a prosperous culture in Britain. Fernleaf Software is at Fernleaf House, 31 Old Road West, Gravesend, Kent DA11 01H.



Wordwise to run on Aries board

WORDWISE, the wordprocessor on a chip from Computer Concepts, has been updated to make use of the Aries B20 RAM board.

This means *Wordwise* can be used with an 80-column display without losing text space. Computer Concepts will upgrade a *Wordwise* for £10.

***Caretaker* is Computer Concepts' Basic utility ROM. This provides extra commands to help de-bug and develop programs. It costs £33.35.**

Chip helps ROMs

MANAGER is a chip from Watford Electronics for users of sideways ROMs, and programmers who want to put software into EPROM.

It supplies extra information about some of the *FX commands, and the ability to select ROMs, so avoiding any clash of commands.

The chip should be available now at an initial special offer price of about £21.

COMPUTER CONCEPTS

ROM SOFTWARE
for the BBC Micro

Caretaker
BASIC Utility ROM

CARETAKER is a BASIC utility ROM which provides many new invaluable commands to help the BASIC programmer. Because CARETAKER is in ROM, it uses no BASIC program space and its commands are always instantly available. Some of the CARETAKER commands are detailed below:

***EXCHANGE** - provides a search and replace facility, either global or selective. 'Wildcard' characters and BASIC keyword tokens may be included.

***EXPAND** - Lists a program in an easy-to-read form, also allowing 'squashed' programs to be read.

***INSERT** - Enables BASIC routines on disc or tape to be inserted into or added to the program in memory.

***KEYLOAD** and ***KEYSAVE** - Load and save the function key definitions.



***LVAR** - Lists the values of all or some of the variables.

***MERGE** - Will merge one or more BASIC programs on file into the program in memory.

***MOVE** - Allows the current BASIC program to be moved to a new page in memory.

***PARTSAVE** - Saves only a selected section of a BASIC program (useful for later merging).

***RENUMBER** - Renumbers parts of BASIC programs and moves the renumbered section as necessary.

***RETRIEVE** - Restores a corrupted program to a form in which it can be listed and edited.

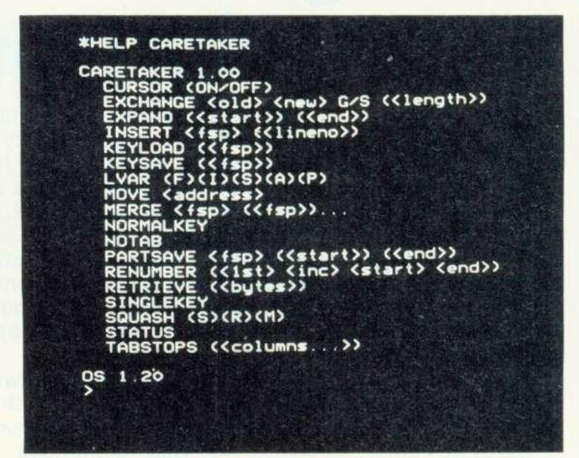
***SINGLEKEY** - Enables BASIC keywords to be entered quickly, as on the ELECTRON.

***SQUASH** - Reduces the size of a BASIC program in order to save memory space. A very efficient routine.

***STATUS** - Displays the values of PAGE, HIMEM, program length, bytes free, etc.

***TABSTOPS** - Provides a tabulation facility. Up to eight tapstops can be defined.

CARETAKER is supplied with a spiral bound manual, special 'single-key entry' stickers for the key fronts, and easy-to-follow fitting instructions. A full specification is available upon request.



New Release

£33.35 incl.

The Most Popular Word Processing ROM for the BBC Micro

Wordwise

£46.00 incl.

WORDWISE is ideal as an introduction to word processing for the beginner, but is a powerful enough tool to be used seriously by professional authors (at least two of the most popular BBC Micro magazines are prepared entirely with WORDWISE). Being entirely ROM based it occupies none of the memory which is used to store text. It will operate fully on cassette, disc or ECONET (level II). It is not specific to any particular printer, nor does it require a special printer driver (an expensive extra on some word processors). WORDWISE allows any codes to be sent to any printer, at any point within the text, by using a simple 'embedded command'.

For the beginner, text can be typed straight into WORDWISE and saved, loaded, previewed or printed immediately. Once experience is gained, commands may be added to control the final layout on paper. Some of the layout or 'formatting' commands are described later. At any time whilst the text is being entered or edited a word count is displayed continuously on the top line. Labelled function keys provide the user with simple controls to mark any section of text and then delete, move or copy it to any other position. Characters can be quickly converted between upper and lower case; changing case of entire paragraphs is equally simple.

```
WORDWISE
(C) Computer Concepts 1982

1) Save entire text
2) Load new text
3) Save marked text
4) Load text to cursor
5) Search and Replace
6) Print text
7) Preview text
8) Spool text

ESC Edit Mode

Please enter choice_
```

Moving around the text is simple. Cursor keys alone move one position in any direction; CTRL and cursor keys together move in larger steps, a word left/right, a page up/down; SHIFT and cursor keys move as far as possible to the right/left of the line or to the start/end of the entire text. These movements are so easy to use that many other programs have adopted exactly the same method.

Formatting commands include the ability to split the document into pages of any length, with or without headings or footings. Page numbers may be printed automatically within the text, including within headings and footings. Commands are provided to set (at any point in the text) line length, left margin, tabulation positions, line spacing etc. Text can be centred on a line, indents and temporary indents can be set and cancelled. Output can be made to automatically pause at the end of a page, e.g. for a single-sheet feed. Right justification of text can be turned on and off at any points in the text.

User-defined keys may hold any required string as normal and used within WORDWISE, including the codes required to induce key operations such as cursor movement.

ARIES compatible WORDWISE

A new version of WORDWISE is available upon request at the standard price which is fully compatible with the ARIES B20 RAM board. When fitted alongside the compatible WORDWISE, the ARIES board allows text to be previewed in 80 columns even with the normal RAM full of text. An upgrade from the standard version of WORDWISE is available. Please ask for details.







16 Wayside, Chipperfield, Hertfordshire. WD4 9JJ Telephone: Kings Langley (09277) 69727

EXPANSION FACTOR

What does the Plus-1 add to the Elk? Bruce Smith makes the connection

PLUS-1, the long-awaited Acorn interface for the Electron, has arrived, and without any of the delays that beset the computer industry these days. It adds the following capabilities to the Elk:

- Two cartridge slots for ROM-based software.
- A parallel printer port.
- Four eight bit analogue-to-digital input channels.

Aesthetically the interface is without frills but it complements the Electron to provide a neat and professional unit. Connecting the Plus-1 to the Elk is extremely simple and no difficulty should be encountered.

First, the plastic cover on the expansion bus must be removed to expose the edge connector. With both units upside-down, the protruding front edge of the interface is pushed over the expansion bus and into the recess at the rear underside of the computer.

Fixing the Plus-1 to the Elk is done with the aid of a coin! Two large bolts locate into the threaded holes in the Elk's case. The connection is firm and only a slight flexing is possible, so no problems with data corruption should be encountered. Once in place, the Plus-1 adds another 100 millimetres (4in) to the depth of the computer.

Externally there are four ports, two for the cartridge software and one each for the printer and ADC connector. Internally the main printed circuit board is more spaciously laid out than previous Acorn boards. Software for the Centronics printer interface, the ADC drivers and for downloading cartridge software were contained within an EPROM version 1.00 on the review model. Apart from the ADC chip, an ADC0844, and the OS EPROM, all chips are soldered directly to the main PCB.

The ROM cartridges can provide a variety of applications, including games, utilities and paged languages. Supplied with the review model were the six cartridges currently available: *Snapper, Hopper, Starship Command, Tree of Knowledge, Countdown to Doom* and *Lisp*.

Two sprung flaps on the rear mark the cartridge ports. A cartridge is inserted through a flap and into the socket at the base. If two cartridges are inserted the nearer of the two has the higher priority and will be selected.

Once in position cartridge software is Chained simply by pressing the Break key, which boots the first file on the cartridge. Language ROM cartridges – *Lisp* in the review bundle – are switched in at &8000 and therefore replace Basic, which can be reselected by removing the language cartridge or typing *BASIC.

The filing system used by the ROM cartridge system is in fact the *ROM filing system (RFS) as used on the Beeb, making it a simple task for commercial establishments to blow their own cartridge ROMs. *CAT, LOAD and CHAIN are all available with the RFS.

The ROM cartridges themselves are neat, slightly smaller than a cassette and the plug-in portion is a PCB edge connector. An interesting aspect of their design is that the silicon itself has been bonded onto the main PCB and coated with plastic to protect it, thereby doing away with the more expensive standard ROM packaging.

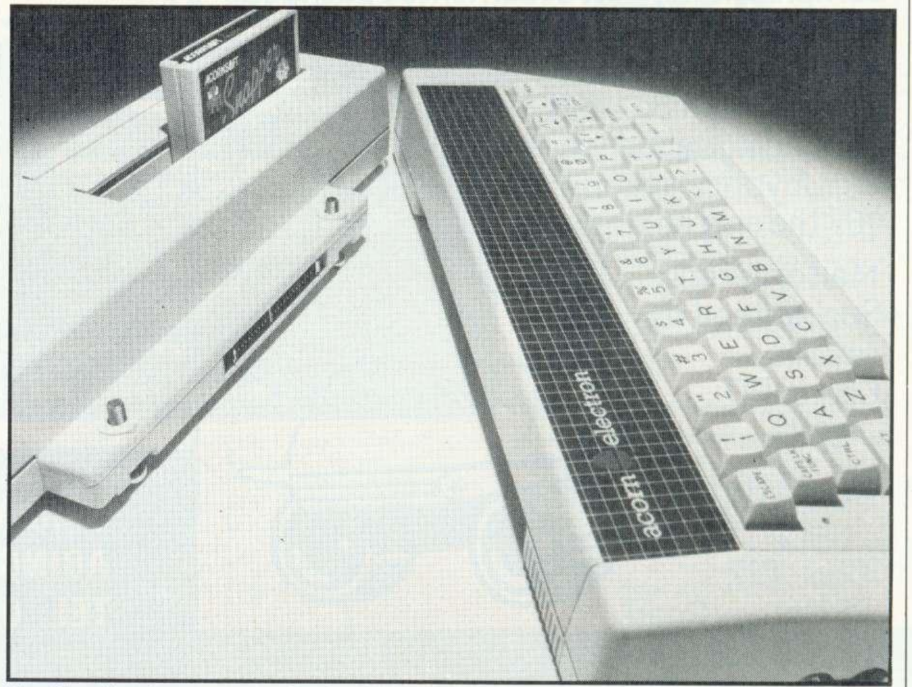
The printer port is a standard Centronics compatible parallel interface. CTRL B (VDU2) and CTRL C (VDU3) 'switch' the printer on and off for printing purposes, while VDU1 will send control characters to the printer. I had no problem using my Star Delta, and my screen dumps performed correctly. Several *FX commands are included within the Plus-1 OS to help matters.

The most obvious use of the analogue interface for the home user is for connecting a joystick. Most of the games ROM cartridges are joystick-compatible and my Voltmace stick performed as expected, and any joystick with an impedance of at least 10 ohms would be suitable.

The ADC channels can be read from Basic using the ADVAL command, while *FX16 allows channel selections to be made. The analogue port also allows various peripherals to be interfaced to the Electron, provided they are electrically compatible.

Full details on using the ADC and printer ports and on the cartridges are provided in the Plus-1 *User Guide*. The 22-page spiral-bound volume also contains lucid accounts of connecting the Plus-1 to the Elk.

The price of the Plus-1 – £59 – represents good value for a very useful unit. Acorn has got its sums right with the Plus-1, and it must be the first serious buy for an Electron owner.



The Plus-1's edge connector is simply pushed into the back of the Electron and bolted on


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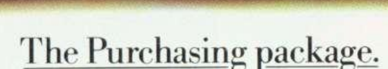
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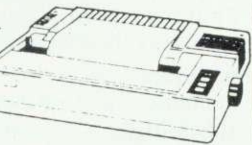
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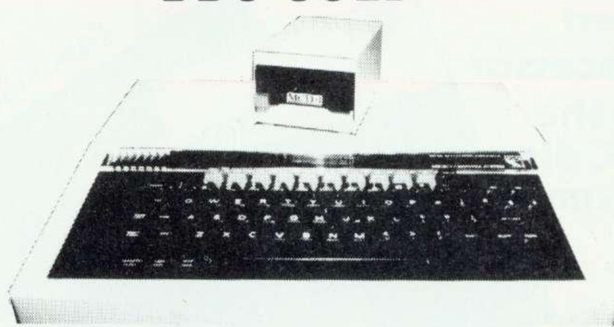


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- Will use disc surfaces 0 to 3 as allowed by the BBC system.
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- Exec document — allows conversion of BASIC programs for editing by word processor and then re-conversion back to either text or program files.
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Database comes in chip with manual, simple fitting instructions & systems disc. Also planned is the production of Database integrated with the Merlin Scribe word processor in a single chip although the database is designed to integrate easily with Scribe in a separate chip.

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FUTURE CONNECTIONS

The new ideas in contact-by-computer



COMMUNICATIONS for home computer users by satellite, cable and cellular radio is not just a distant possibility: it's happening now. On the following pages Joe Telford and Paul Curtis and Elliot Hessey look at the finer details of connecting personal computers to the public switched telephone network (PSTN, as it is known). The best is yet to come however, as faster, cheaper and more widely available methods of communication come on stream. Some manufacturers such as Torch and Commodore have taken the initiative and provided PSTN-based services for their customers already. Torch's Torch-Mail allows users of its business-oriented computers to exchange messages and software automatically, even when the machines are left unattended. This allows the computers to communicate when calls are cheap and with minimal effect on other telephone users.

One of the major new ideas in computer communications is distributed systems: the splitting of a large or complex task among a number of computers. This is logical for humans; only a moment's reflection brings examples such as the typing pool to mind. However, in the past computers have tended to be too expensive for all but the richest users to be able to exploit distributed computing. The advent of the microprocessor has changed all this.

Where a computer needs to exchange data with another distant computer, the PSTN provides a simple enough method. By merely adding a modem to most computers it is possible to send and receive data this way. Systems such as Micronet and bulletin boards are now very popular as a way for micro users to swap programs, hints and gossip. As the ways that we connect computers together improve, so we can expect to see more sophisticated uses of computers. It would be nice if you could leave your computer a list of things you want to know when you go to bed, and wake up the following morning to find your questions answered. This is what the Torch machines can do now.

A disadvantage of today's dial-up computers is that if the central machine breaks down all users suffer. To overcome this problem we can split the information that we want to store among a number of machines. This obviously complicates retrieving the information, but it means that one computer failure will not necessarily affect so many users. The second useful effect of distributed computing is the sharing of expensive resources such as hard discs or high-quality printers. Local area networks such as Econet permit sharing of this kind on the small scale, but obviously we cannot wire the whole country into an Econet.

The PSTN is an obvious medium to use when introducing a distributed system. It is not really effective as a medium for high-speed data though, so further improvements are needed. Two new developments seem likely to be of help.

First, the introduction of cable TV will provide many homes with a very efficient medium right into the front room. The most important difference between cable and ordinary broadcast TV is that cable users can answer back. Initially, cable companies will use this facility to let viewers vote on programs and answer quizzes from their armchairs. It is also an almost perfect way of sending computer data, and a fast one at that.

The other important new service is the introduction of cellular radio. This technique lets telephone users move around wherever they choose by using a hand-held or car telephone. The cellular radio control system will then route calls to them automatically. To begin with it will provide only a voice service just like the PSTN, but the operating companies are looking hard at the possibility of sending computer data too. Connecting telephone and television all around the world will link every subscriber with common data channels. The possibilities are mind-boggling – it's really just a question of how many users are willing to exercise their wallets.

REMOTE

Paul Curtis and Elliot Hessey monito

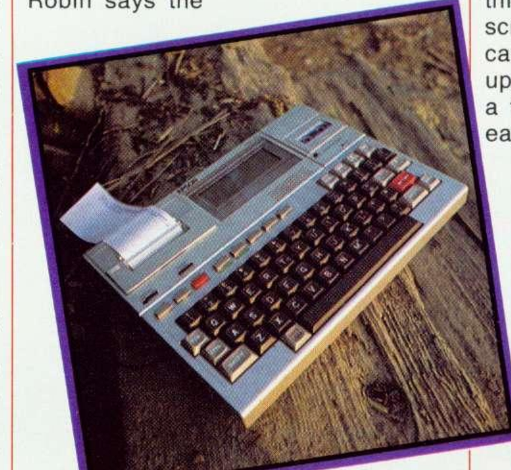
THE TV production team working on the BBC's Computer Literacy Project has been using the telephone system to send data backwards and forwards in their work for some time. Robin Mudge, director of the recent *Computers in Control* series, and Clive Williamson, his assistant, are old hands at electronic mail and its uses.

For Robin, the worst part of being an assistant producer used to be script writing; not thinking of the ideas but the act of setting pen to paper. Each programme script has to be re-written many times as ideas develop, a thought he found depressing at best. However, Robin soon discovered wordprocessing through *Wordwise* and *View* on the BBC micro, and found them real life-savers. He could really enjoy writing, but quickly discovered limitations. Time spent out of the office researching stories meant no wordprocessor, as the BBC micro is not exactly ideal for carrying around. But the advent of portable micros, and British Telecom's electronic mail service called Gold, meant he could write on location and send the text back to base, where it could be worked on by a BBC micro.

The first useful portable computer was the Epson HX20. This was quickly followed by the Tandy model 100 and the NEC PC8201A and more recently the Sharp PC5000. Both the Tandy and NEC have large liquid crystal displays showing 40 columns by eight lines and come with limited wordprocessing and communications software. The latter enables the portable micro to communicate with another computer over the phone lines via an acoustic coupler. The coupler has two rubber cups that fit tightly over the mouth- and earpieces of an ordinary telephone handset, insulating it from sounds other than those produced by a small loudspeaker and microphone which transmit and receive the audible tones used to carry data. The Sharp PC5000 is one of the latest portables and although heavier than other lap computers, it has all the facilities of a 16-bit desk-top machine with an 80 column by eight line LCD display and runs application software from magnetic bubble cartridges, including a powerful wordprocessor and the essential communications software.

Robin prepares text on the portable and sends it over the phone into BT's electronic mail system. This can be done anywhere in the world as long as a telephone is available. At any time the BBC model B back at base can be connected to the electronic mail service and text loaded from it into a *View* or *Wordwise* file. Of course the system works in both directions, so messages can be sent to anybody. All the members of the BBC's Computer Literacy team have an electronic mailbox and so can communicate with each other at any time.

Robin says the



system offers a great deal of flexibility. 'First, it gives users a great deal of freedom; you can move around with peace of mind knowing you are in contact with the office at all times. Second, it offers enormous flexibility in the use of different machines and software within the same group. As long as the micros can all talk to the electronic mail computer, text from any number of different machines and wordprocessing packages can be freely interchanged and merged. Of course it does have its drawbacks – you can't hide away! Gold can even tell the sender if you have read your messages. Also, I like my portable so much that it's difficult to stay in the office when the sun shines.'

In the comfort of his home in London, Clive Williamson uses a BBC micro to get at the information on Telecom Gold. His model B is fitted with a Computer Concepts *Communicator* ROM, and a modem. Both *Communicator* and modem can be set up to operate with a range of baud rates, so the system can work with either the 1200/75 or 300/300 standards available on Telecom Gold.

'To keep phone bills down,' Clive confides, 'I use the 1200/75 baud rate when I'm expecting to receive Robin's text, and 300/300 to send it back in its augmented form. A long file would take ages to send at 75 baud, which only transmits at about seven characters per second. *Communicator*'s parameters can be changed easily using a function-key driven menu to alter things like send and receive rates, screen display and telecommunications protocols. Once it has been set up, all the parameters can be saved as a file on disc or tape, and loaded in each time you switch on!'

The modem's default conditions are suitable for 1200/75 operation on Telecom Gold, so Clive has to load in a file he has called '300/300' to work at the alternate rate. He also has to change some settings on the front of the modem to match the output from the BBC micro's RS423 serial interface.

Having sorted out his equipment, Clive dials the Telecom Gold computer, and as soon as he hears the carrier tone, switches the modem on line and replaces the telephone handset. The modem then maintains the connection, and Clive can log on to the system using his own account number and password. The modem gives a very reliable link to the BT computer because it makes a direct connection with the telephone line, but for this reason it is essential to obtain BT approval to use it.

The text file from Telecom Gold is in the form of a stream of ASCII characters and *Communicator* turns the BBC micro into a 'terminal' to receive the file, and display it on the screen. The text can also be printed out, or

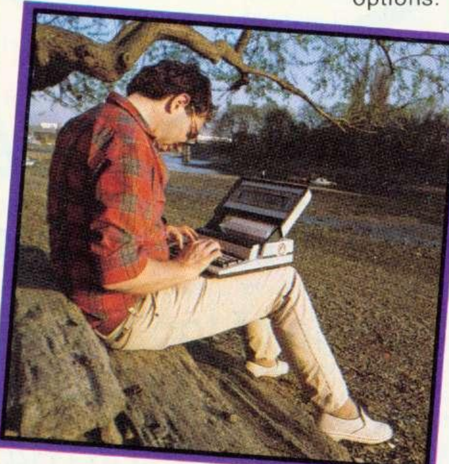
POSSIBILITIES

an application for electronic mail that involves strict deadlines

'spooled' to disc using the function keys. Once Clive has stored the file on disc, he can send notes to other users on the system before signing off to begin work on Robin's text. A spooled file can be read back into either *Wordwise* or *View*. Clive uses *View* to make his additions to the text, because of its extra functions like search, change or optional replace; and its 80 character display. When the additions have been made, he saves the work by opening a new file with *SPOOL, and then uses *View*'s screen command to save another ASCII file on disc with a new file-name.

'The new file could then be sent straight back to Robin on Telecom Gold for him to read and revise', says Clive, 'but I usually tidy it up first by running it through *Wordwise*. That way I can remove the unwanted carriage returns and the *View* command page heading that always creep into the file before you can use *SPOOL to close it.'

It seems that *Wordwise* provides the easiest medium for handling files from Telecom Gold, because its menu has a trouble-free option to read files in and spool them out again without the introduction of any extraneous characters. 'Using both *View* and *Wordwise* is a luxury,' explains Clive, 'and *Wordwise* alone would be quite sufficient!' With the new file on disc, Clive re-dials the Telecom Gold number (for the faster 300/300 rate this time) and logs on again to send the revised work to Robin's account number using *EXEC through another of *Communicator*'s options.



LEFT TO RIGHT:
Epson HX20: a 16k, eight-bit portable with built-in printer and microcassette recorder running a communications software package from Transam in ROM. This package enables the little printer to print 80 character pages sideways! Optional extras include floppy disc and TV display. Starting price £480

Sendata 700B acoustic coupler. Supplied with rechargeable nickel-cadmium batteries and charger. Approx £250

Clive Williamson with his BBC model B and modem running Computer Concepts's *Communicator* ROM

Robin Mudge with his Sharp PC5000 portable computer on Bank Holiday location!

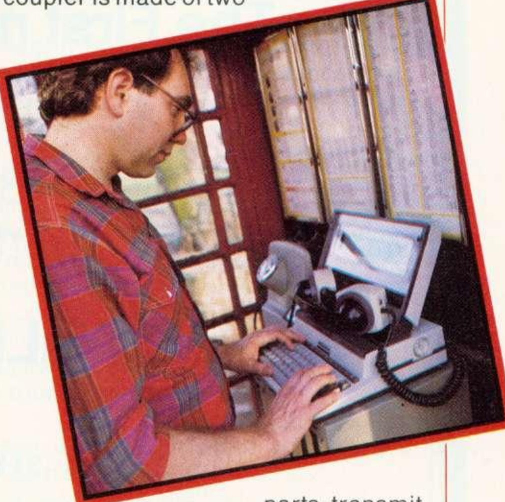
Using an acoustic coupler, the portable micro can talk to the British Telecom electronic mail computer anywhere

The receiving and sending procedure can be repeated as often as necessary to finish the work, with Robin picking up the text whenever he happens to be near a phone. Once finalised, the file can be printed out in the office and used as required. Clive recently wrote a piece for *Acorn User*, and was able to beat the post by sending it to the Editor's Telecom Gold account number, where it could be retrieved for immediate editing on a wordprocessor.

This approach to using telecommunications may seem a little ambitious for home users of the BBC micro, but it has obvious implications for small-business users, particularly those with 'reps' on the road. Reports and messages can easily be relayed over the system, irrespective of time differences between countries or people not being available at a particular time. Each user simply logs on to see what messages are waiting, and file a report if required. The cost of joining Telecom Gold is currently quite high (around £100 for the first month), but once some user groups have been set up (in the same way that Micronet 800 is available for microcomputer owners on Prestel) the price to the individual could drop. Then we would see the system in much wider use, and once that happens, electronic mail will certainly be here to stay.

SENDATA 700B ACOUSTIC COUPLER

THE Sendata 700B is a compact battery operated acoustic coupler for use with any computer having an RS232 interface. It comes in one of two preset baud rates, 300 send and 300 receive for normal data transmission and 1200 send and 75 receive for use with Prestel-type services. The body of the coupler is made of two



parts, transmitter and receiver, which are joined by a flexible concertina-type section. This enables the coupler to fit a wide range of different handsets. It is clearly marked to show which way the telephone receiver should be fitted. The snug-fitting rubber cups insulate the

phone from outside noises that could interfere with data transmissions. Rechargeable batteries are contained within it and an external recharging unit is supplied. There is a small switch on the transmitter section that changes the operating mode from originate to answer. Using two of these couplers, computers can communicate directly, one originating data and the other answering it. Cost about £250.

MINOR MIRACLES WS2000

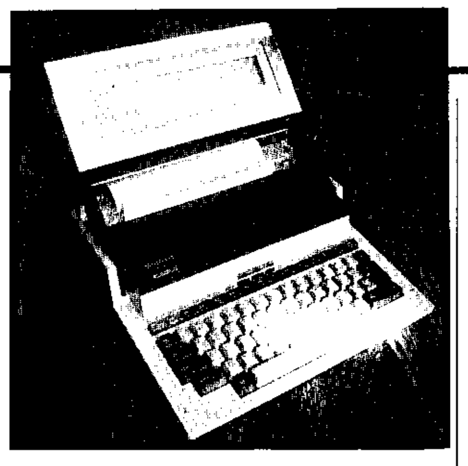
THE Minor Miracles WS2000 is one representative from the 'new wave' of low-cost modems currently appearing, and offers more facilities than most. At the moment, however, it awaits British Telecom approval.

COMMUNICATOR

Computer Concepts' *Communicator* program is supplied as a 16k plug-in EPROM, and is ideal for use with modems. In its basic configuration it can be used to communicate with Telecom Gold at the 1200/75 rate, but its parameters may be changed to accommodate many other modes of operation. It is also designed to turn the BBC micro into a mini or mainframe terminal, and can pretend to be a DEC VT100 or VT52 terminal. This well-designed ROM generates a series of clear menus to help set up the parameters, and these can be saved as a file and loaded in again to speed up future use. It is also possible to edit the Beeb's user-definable function keys to generate strings, such as ID codes for logging on to particular computers.

Communicator works with the second processor, but current versions will not reset when the micro's BREAK key is pressed. It works perfectly with an unexpanded BBC micro, however, and normally gives a pleasant white-on-blue 80 column display. *Communicator* costs £69.

Computer Concepts also markets a language ROM for the BBC micro called *Termi* which costs considerably less at £33 and offers many of the facilities of *Communicator*, but without the frills. *Termi* is on an 8k EPROM and will work with or without the second processor.



Sharp PC5000: this 128k, 16-bit machine has an 80-character by eight-line display and optional thermal printer running Superwriter software under MS-DOS. Options include 128k bubble memory packs, 64k expansion RAM modules, floppy disc drives, full range of MS-DOS software. Starting price £1195

BUZZWORDS

A glossary of terms used in computerised communications

Acoustic coupler Device for connecting a computer to the phone lines via the telephone handset.
Baud rate Serial transmission rate in bits per second.
BT British Telecom.
Carrier A high-pitched tone which 'carries' the transmitted signal.
Carrier detect An output line from the modem to the computer which indicates a carrier is present.
Control register Information written to this register commands the ACIA to perform certain tasks.
Dumb terminal A terminal which can only transmit and receive. Information cannot be passed to and from printer and discs.
Electronic mail Information sent between people using entirely electronic means.
Even parity Where the total of bits set to the binary value 1 in a byte plus the parity bit will be an even number.
Full duplex Mode of operation of a communications system where the host computer re-transmits every character it receives. This verifies the reception of the characters.
Half duplex Mode of operation where the terminal prints each character as it is sent. Half-duplex terminals on full-duplex systems give ddoouubbllee tteexxtt..
Hacker American term for hobbyist computer user (recently associated with electronic communications in the movie *War Games*)
Hardcopy Printout from a computer or generally print on paper.
Host An answering (usually large) computer system which you can use with a terminal.
Log off Leave a host system.
Log on Connect with a host system.
Mark The time during which a bit is set to 1.
Modem From the word *mod*ulator-*dem*odulator. A device which connects a computer directly to the phone lines. Needs BT approval.
Odd parity Where the total of bits set to 1 in a byte of data plus the parity bit will be an odd number.
Off-line When a printer or terminal is disconnected from a host computer it is said to be 'off-line'.
On-line When a printer or terminal is connected to a host computer it is said to be 'on-line'.
Parity To check the integrity of data some systems include an extra bit, called a parity bit in each word transmitted. From this bit it is possible to tell whether the word has been transmitted correctly.
Register (ACIA) An area of memory (1 byte) shared between computer and ACIA.
Ring detect An output line from a modem to a computer which indicates that the phone is ringing. (NB in most auto-answer modems, the phone bell does not sound).
Smart terminal A terminal which can cope with accesses to its own disc and printer. It can normally send and receive whole files which can be stored or printed out.
Space The time during which a bit is set to 0.
Start bit The first bit transmitted serially. It indicates the start of a word.
Status register Register in the ACIA which contains the present state of the ACIA hardware.
Stop bit/s The last bit or two bits transmitted in the word.
Terminal A keyboard and screen or a BBC micro with RS423 software capable of communicating with a (large/r) computer.
Word Group of bits which make up the serial transmission parameters for any character.

Joe Telford's primer on turning the Beeb into a terminal: how the systems work, hardware, software, and a comms simulator

LOGGING ON

ONCE upon a time when I wanted to get text to our illustrious Editor, I would call on the services of a local pigeon expert and dispatch a 'jotting', tied to the leg on Acorn Fancier's bird. However, times have changed, and Kitty no longer enjoys her trip to the top of Nelson's column to pick up the mail. Spurred on by John Coll's article (October 82) I have been looking at electronic mail and information systems available to the average Acorn user through telephone links.

There are a number of services available, including: commercial mail order systems; bulletin boards; information providers and electronic mailboxes. A system normally has one of these as a main task, but often supports additional features. For example, British Telecom's Prestel is an information provider, but items and services can be bought on Prestel, and in addition mail can be sent and received through its Microcomputing section which has recently replaced Micronet.

Commercial mail order systems

An electronic mail order system allows people to dial a distant computer which contains a database of items, from which to choose. Prices tend to be always up-to-date, and customers can be immediately informed of items out of stock. Payment can be made by quoting credit card numbers. A typical example is Distel, which contains a catalogue of electronic components and information. Such commercial databases are expanding, so that in the future many services will be available via computer.

Bulletin boards

Many bulletin boards are run by amateurs or user groups. On dialling a bulletin board, facilities such as reading messages; deleting your own messages; writing messages and examining various activity notices are often available. Bulletin boards seem to be the computer user's equivalent of CB radio, although the American disease of 'handles' is not widespread. I don't feel inclined to reply to 'The Magnetic Surfer' on line from California, but I might talk to 'Ian Birnbaum' on line from Hull. A typical board might be Forum-80 which is based in Hull. Prestel also includes closed user groups like Micronet 800 and Viewfax. On joining these, access is automatically gained to Prestel, though not the other way round.

Information providers

Prestel is fast being recognised as chief among the information providers. With appropriate software, it is possible to receive coloured teletext screens from Prestel on a number of topics. Prestel produces a directory of information and news items, which is delivered to members. One useful point is that many companies joining Prestel become information providers. One of the latest is Kodak, which details its current products as well as general photographic hints and tips.

Electronic mailboxes

Electronic mailboxes provide a message service between subscribers which works on the principal of sending and receiving mail to private mailboxes. Such a system can contain confidential information, and system operators must apply the highest standards to achieve true data privacy. A typical electronic mail system is British Telecom Gold (BTG). This allows mail to be sent, received, deleted and carbon copied between users. In addition, it gives access to a noticeboard, diary and conferencing system. BTG subscribers are normally companies who operate a user group within the system, so one might find accounts for firms like Acorn, BBC, MEP, Amstrad and others.

Equipment

Contacting any of the services detailed above requires a certain amount of equipment. The simplest needs are:

- BBC micro (model B) + monitor.
- Modem or acoustic coupler.
- Terminal software.
- Telephone.

The micro needs no further explanation, and the telephone is an obvious requirement.

Software must reflect your needs, and although this article provides some dumb terminal software, users might find purpose-built 'smart packages' (eg *Termi* or *Communicator* from Computer Concepts) more useful. 'Smart' terminal software will allow the use of discs and printers, enabling wordprocessed files to be sent and received via the phone lines.

The modem or acoustic coupler is worth considering carefully. An acoustic coupler can be attached to a telephone simply by pressing the telephone handset into the coupler. Beware, however, of the older couplers and the newer slimline phones – they just don't fit together. An acoustic coupler costs £50 upwards. The main disadvantages is that the coupler is often sensitive to vibration, line interference and external noise. (One cheap coupler I used would function properly only when laid on a sponge rubber pad, and covered with towels!)

Modems are more reliable, but have their own problems. First, they connect directly to the phone line, and therefore *must* be approved by BT. Second the modem plugs into the new-style BT wall sockets, and you may need to have these fitted. Approved modems will carry a sticker with a green circle and the text: 'Approved for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use. BT Approval No. ....' BT may well ask which modem you want to use, and require you to quote the approval number and the name of the modem.

Baud rates

When choosing a modem or coupler, one important point to consider is the 'baud rate' which gives a measure of how fast information is carried. There are three common transmission rates:

Transmit	Receive
300 baud	300 baud
75 baud	1200 baud
1200 baud	1200 baud

Most common is the 300/300 rate, but this is quite slow and so the others are becoming more used. Modems which handle the higher rates are generally more expensive, though the range starts at about £70. Readers should note also that Prestel particularly requires the 75/1200 rate.

Costs

Unlike many applications of the BBC computer, electronic communication has a number of costs after the equipment has been purchased, the most obvious of which is paging for phone calls. Readers should be aware that few calls will be shorter than 10 minutes. Many readers will not be within a local call of a computer system, so a 10-minute, 'b' rate call (to a system further than 35 miles) will cost £2.50 at peak time, and £1.90 at standard time. Amateurs may find cheap time best for their electronic communications.

Costs are at present:

Cheap time distance	Time for 4.4p (direct dialling)
Local	8 mins
Up to 35 miles	144 sec
Over 35 miles	60 sec

Cheap time is 6pm to 8pm weekdays and all day Saturday and Sunday. A typical 10-minute phone call to Distel will cost 44p. Distel and some of the bulletin boards are cheap, or free to access. Many of the larger ones like Prestel and BTG have other charges. Before joining any mailbox system, users must ask certain questions, as in table 1. If you don't ask these questions, quite a surprise may arrive in a phone bill or membership account. These costs can be reduced greatly by following the 'golden' rules, outlined in table 2.

1. What is the cost of my phone calls likely to be?
2. What is the membership fee?
3. How often must it be paid?
4. Is there a charge for 'computer time' on the system?
5. If so, what is that cost per minute or per phone call?
6. Is there a charge for storing information on this system?
7. If so, what is it in terms of cost per month per k stored?
8. Is there a charge for retrieving information stored by others?
9. If so what is it likely to be?

Table 1. Questions to ask about costs

1. Make each call purposeful, ie know what you are doing. Do it, then log off.
2. Always access the system from as close as possible, eg it is possible to enter BTG or Prestel via 18 nodes around the country. This saves phone bills.
3. Never write long messages via the phone lines. Buy 'smart' software and transmit messages from disc.
4. Get a hard copy of your favourite system's 'help' files and know how to use them before going on-line.
5. Use as fast a transmit/receive rate as possible.
6. At the end of your phone call hang up immediately. You may still be connected via BT.

Table 2. Golden rules for cutting costs

Connecting to a distant computer

How you contact a distant computer varies depending on your equipment and on the system in question. A typical sequence of events is as follows. First, connect your modem or coupler to the BBC micro and power up your own system, then load and run the terminal software. At this point many modems or couplers confirm that they are transmitting (for example, the Buzzbox modem and the K&N acoustic coupler pulse a 'DATA' light with each keypress). Now dial the number required on your phone and wait to be connected. When you hear a high pitched tone (from the phone) push the handset into the coupler. If you have a modem press the 'data' button. Some systems will immediately produce text on screen, but many need to hear your 'mark' to say you are there. Try pressing the return key a few times and check for a response. Once you have text on screen you are into the system. Some computers require a further stage called 'logging on'. This will require you to give some information such as name, address, and/or a password. Failure to comply often results in disconnection.

After using any system, always log off with the correct command or menu option, rather than simply hanging up, otherwise you could be paying for machine time you aren't using.

Transmitting from the Beeb

The RS423 port on the BBC micro allows information to be sent not just to other computers but also to printers, and modems. It is therefore useful to know what is happening inside the computer whenever a signal is sent. Figure 1 shows the internal organisation of the BBC computer around the RS423 system. A signal from a key on the keyboard is processed and passed to the ACIA chip located at a particular set of memory addresses. From the ACIA the signal travels to the serial ULA from which it is sent to the RS423 output line.

If a modem is used, this signal is further modified for transmission via the phone lines.

In transmitting a byte on the RS423 system, the user provides a data byte which will always, on the BBC micro, be eight bits long. If we are transmitting to another BBC micro then sending eight bits is quite acceptable. However, some telephone systems (eg BTG) only use the least significant seven bits of a byte, and so transmission – and particularly reception – should make use of the seven-bit option in the ACIA control register. This is the complete ASCII character set, so all text characters will be transmitted.

To check on information we send an extra bit of data which is set high or low depending on the number of 1s in the byte we are transmitting called 'parity checking'. In odd parity, the number of 1s including the parity bit will be odd, while in even parity the number of 1s will be even. Considering the letter A in odd parity we would send:

A = 1 for odd parity + 01000001 = 101000001

In even parity we would send:

A = 0 for even parity + 01000001 = 001000001

The actual transmission

Imagine we are transmitting the letter A above with eight data bits, odd parity, and one stop bit. The actual series of pulses from the RS423 port might be:

0	10000010	1	0
Start bit	lo data hi	parity	Stop bit

Transmission should be read left to right.

Between BBC micros, the 1s and 0s would effectively be transitions between voltage levels (figure 2). If a modem or acoustic coupler is used, the voltage levels would be converted to high and low pitched sounds, so binary 0 might be represented by a tone of say 2400Hz (though the actual tone depends on the type of modem) while binary 1 could be represented by a lower tone (figure 3).

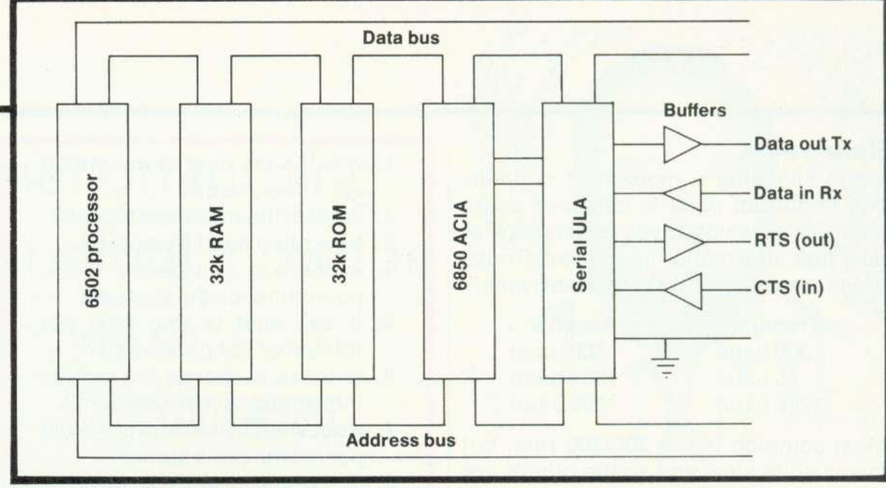


Figure 1. The BBC's RS423 hardware

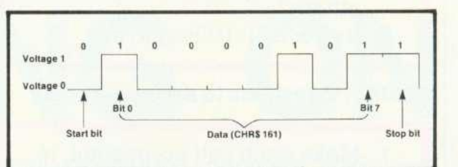


Figure 2. RS423 port output (eight data bits, no parity, one stop bit)

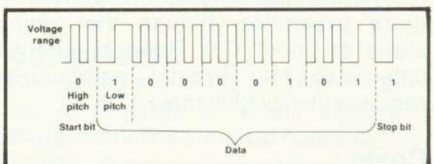


Figure 3. Output from modem (eight data bits, no parity, one stop bit)

Simulating RS423 transmission

Program 1 (pages iii–iv) is an RS423 transmission simulator, which demonstrates each step of the process in sending a signal via the RS423 port. Once it has been typed in and saved, run it. You will be asked how many bits (seven or eight) are used to transmit data. Next the type of parity is entered, and finally the number of stop bits. In these three questions, the program will not allow word formats which are not available on the BBC micro. Errors are flagged by a beep and an error message. The opportunity to re-enter data is given at each point where an error occurs, with the exception that where only two choices occur, the computer will select the correct choice to make up the word format, after an incorrect input.

Once the three questions have been answered, the program displays the transmission screen. Whenever a CTS signal is available, shown by a light on the display panel, characters may be typed at the keyboard. Each character is shown in the box marked 'CHR'. If it is a control character (less than 32 or more than 126) then the symbol 'CTL' appears in its place.

The next stage in the decoding process is to find the ASCII equivalent of the number. This is placed in the box marked 'ASC'. On the other side of the screen is a box marked 'BINARY'. Into this is placed the binary equivalent of the character, plus the extra bits needed to make up a word for RS423 transmission. Reading from left to right there will be a start bit (0); seven/eight data bits (1s or 0s); a parity bit if parity is being checked; one or two stop bits (1s).

The final two boxes show first what might be the output from the RS423 port in terms of voltage levels, and second what might be the output from a modem in terms of changing frequencies. After the boxes have been updated, each binary digit is converted into a sound and so the complete binary word is heard as a sound something like the transmission from an acoustic coupler. (I decided against having a continual carrier tone as a constant high pitched sound can be annoying.)

Now let's run through the program structure and indicate the main procedures. PROCinit is the first procedure called. It sets up a number of character definitions, dimensions a numeric array and transfers the escape function to the CTRL-@ key. The program then enters its main loop. Exit from this is only by break or CTRL-@. The main repeat loop calls two procedures directly (PROCmenu and PROCsetscreen), then enters a further repeat loop, which handles the actual simulation.

PROCmenu (from lines 250-450) handles the word format of the data to be transmitted. This is done by three sections, where lines 270 to 290 handle the input of data bits per word. Lines 300 to 380 handle the input of the type of parity, and ensure it matches the 'legal' BBC requirements for the number of data bits already entered. The use of the INSTR function in line 330 allows the parity input as a string to be converted to a number. In line 380, this number is further reduced to 0 (no parity), 1 (odd parity) or 2 (even parity).

PROCsetscreen is called after switching to screen mode 4 in line 70. The aim of this is to set up the screen display for the actual simulation, and in so doing, it makes much use of repeated calls to PROCrect. Once the screen is set up PROCcrsr is called to turn off the cursor.

PROCrect simply takes four parameters: bottom-left, x-coordinate of rectangle; bottom-left, y-coordinate of rectangle; length of rectangle; width of rectangle; and draws the rectangle specified.

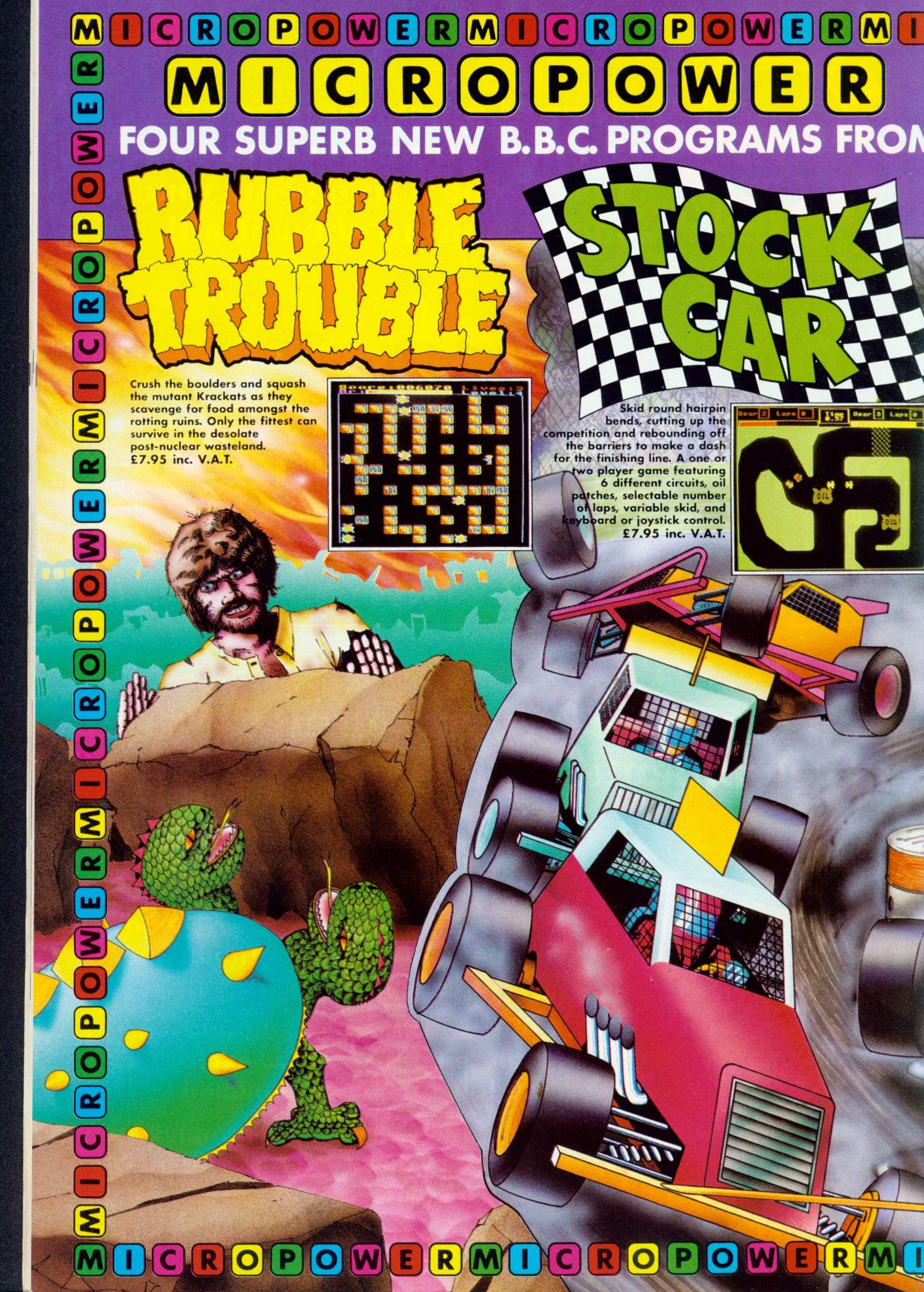
The actual simulation for any set word format is handled in lines 80 to 110. This repeat loop calls one function and one procedure, until the escape key (*not* CTRL-@) is pressed. When escape is pressed, the execution of the program returns to the external REPEAT . . . UNTIL FALSE loop, whereupon the word format is again requested.

FNtype is a short function which calls PROCcts to turn on the clear to send light, then waits for any character to be typed. To more fully simulate the RS423 CTS line, the function flushes any type ahead buffer which might exist by issuing a *FX21,0 at line 740.

PROCsend takes the input from FNtype and encodes it to the specified word format. To do this it relies on a number of sub-procedures: PROCbinary, PROCRS423, PROCMODEM, PROCsound. Before calling any of these, PROCcts is called again, this time to turn the 'light' off. Correctly speaking, the CTS line will not go low until the receiving computer has taken the outgoing data. The simulation appears more realistic however, if we alter the CTS indicator at this point.

PROCbinary calculates the binary word for transmission, and places it into the array 'binary()'. It then calls PROCprintbin which simply reprints the information in the correct screen box. PROCRS423 takes the information in the array 'binary()' and builds up a voltage picture in the RS423 box on screen. This is done in lines 1130 to 1150. PROCMODEM takes the information in the array 'binary()' and builds up a frequency picture in the 'MODEM' box on screen. This is done in lines 1190 to 1210. PROCsound takes the information in the array 'binary()' and transmits it via the sound command, to simulate an acoustic coupler. This is done in lines 1230 to 1250.

Although the program will satisfy many readers, it could be enhanced by the addition of a facility to read and translate random or preset data strings (ie the Rx side of transmission). Many of the necessary procedures will be the same, and hence are already written, simply calculating the binary information then calling the last few procedures in reverse should produce a useful addition. Of course an RTS function will need adding, much like PROCcts. A final thought would be to try to improve typing speed. page 38 ▶



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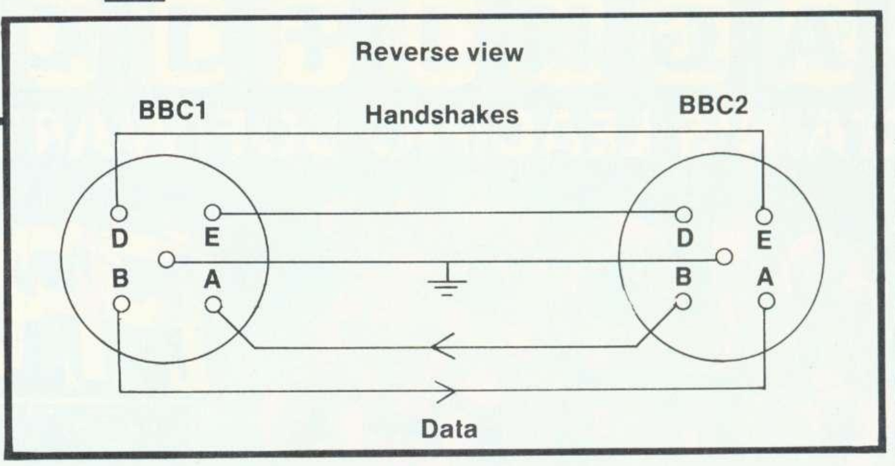


Figure 4. Connecting two BBC micros via the RS423 port

Comms software

Regular readers will remember how back in June 1983 we demonstrated how the BBC micro could be used to produce a 50p network. The idea was that one machine (usually with a DFS interface) could supply Basic programs to others with a simple connection and a couple of commands. Figure 4 shows the connections for a piece of five-core cable. This simple set-up has now been tried at distances over 20 metres in schools, as an inter-classroom loading system. In the home it's an easy way of stopping your children swiping your disc drives. (Keeping one's heirs out of one's hair eh? – Ed.)

Although I used a rather lengthy command line to RTX programs, much practice on the part of my daughter has reduced the sequence for transferring programs from one machine to another to that in table 3 (NB the comments in brackets may not apply to all readers).

In this way, BBC computers will swop lists without any problem at all. Points to check if problems do exist are:

- Is the lead OK? Shortened pins are common, as too are broken wires inside the plastic sheaths. The solution is a continuity tester or multimeter set to measure resistance.
- Are you using screened cable? Unscreened cable is more likely to pick up noise.
- Is the distance over which you are transmitting great? You may need pull-up resistors fitting inside the BBC micro (see *User Guide*). An alternative here might be to reduce the baud rate.
- Have you made sure the Rx micro has no program in memory? The RTX system for transmitting Basic programs is similar to EXECing programs, Txing into a 'full' micro can be quite slow.

The BBC micro will of course allow us to talk to other machines quite easily, even if the hardware handshake lines, CTS and RTS are not available. In this case communications speed might need to be reduced to 1200 baud or less, to avoid losing characters. A typical communications program for BBC to BBC might be as in program 2.

If the CTS and RTS lines are connected, then this appears to work up to 19200 baud, though note that the *FX8,x and *FX7,x lines have been omitted. They will need to be included in most applications. Remember, however, to set the baud rates on each machine to match. This type of terminal program is called a 'half' duplex program, because each half of the communicating system prints its own characters before transmitting them to the distant station.

Many common systems have what is called a full duplex terminal mode. This is shown in program 3, where the distant terminal must be responsible for returning the characters typed at the keyboard. This program is set for 300baud comms by lines 5 and 6. The main body is an infinite loop which simply checks for a character entering the serial port. If one exists, it is printed. The keyboard buffer is then checked for characters, at line 20 and any character found is transmitted to the distant computer. This will continue until ESCAPE is pressed.

1. Connect lead to Rx micro.
2. Perform CTRL BREAK on Rx micro.
3. Type *FX2,1 on Rx micro (Run down stairs. Power-up Dad's system).
4. Connect lead to Tx micro.
5. Load program for Tx-ing.
6. Type *FX5,2 on Tx micro.
7. Type LIST(CTRL-B) on Tx micro.
8. When the program has listed, return the Tx micro to its original state (because Dad can't do adventures. Run back upstairs).
9. Press BREAK on the Rx machine.
10. Type OLD on the Rx machine.
11. The program is ready to run.

Table 3. Transfer sequence from Beeb to Beeb

When SHIFT-f0 (shifted function key 0) is pressed, character 128 is generated, and when SHIFT-f1 is pressed, character 129 is generated. We can add to our program so that whenever SHIFT-f0 is pressed, we enter mode 7, and SHIFT-f1 puts us into mode 3.

Alter line 20 to:

```
20 A$=INKEY$(0)
```

then add:

```
25 IF A$=CHR$128 THEN
   MODE7:UNTIL 0
   ELSE IF A$=CHR$129 THEN
   MODE3:
   UNTIL 0
26 IF A$<>""?&FE09=ASCA$
```

Once equipped with a modem and terminal software, the 'Happy Hacker' can look for a few 'war games' to start. Perhaps the most useful commercial services are:

Distel	01-697 1888 (London)
Homelink	(0602) 419 393 (Nottingham) (or via Prestel)
Cashtel	(0702) 552941

Bulletin boards are springing up continually, for example Mailbox 80 on (0384) 635336 or Forum 80, (0482) 859169.

Run your own

Ever thought of running your own mailbox? This question was posed by schools in Cleveland and an experimental service is at present operating for local schools. This service, called CECCTEL, will eventually provide a software titles list as well as a bulletin service and set of mailboxes. These are all at present in an embryonic state, and experiments with downloading usable software are being carried out. Schools using the service are provided with simple software to allow communication and downloading, though at present they must provide their own couplers. The system runs at 300 baud and is overseen by a trusty BBC micro.

Providing you have an auto answer modem and a BBC micro it's not that difficult to duplicate this sort of system. I would however, encourage home-users to develop a good deal of patience because once you go on-line as a bulletin board, you will be fair game for 24-hour phone calls – and the odd visit from BT. You will almost certainly need a second line, so that your 'normal' existence of talking to people can continue, and it is imperative that the two phone numbers are kept separate.

The problem with auto-answer modems is that they need extra connecting hardware to the BBC micro. Where for example, is the 'ring detect' input to the BBC micro or the 'carrier detect' input? How can the BBC micro

latch the modem to answer while the carrier is present? These are the problem areas of most users. However, we can configure the many interfaces of the BBC micro to meet these challenges.

Latching the modem relay is quite simple. All that is needed is a voltage to be supplied to the appropriate pin on the modem. (The actual connection and voltage may vary between modems.) One simple solution is shown in figure 5 where the modem supplies the switching voltage and the BBC micro switches it via the cassette relay, given a simple procedure like:

```
DEFPROClatch(x)
IFx=1 THEN *MOTOR 1
IFx=0 THEN *MOTOR 0
ENDPROC
```

On many modems the ring detect and carrier detect signals are brought out to a connector. Examining the voltages on the corresponding pins shows a change between −6v and +6v when ringing is detected or when a carrier signal is present. This voltage can drive a small relay, external to both the BBC micro and the modem, which simply shorts to ground one of the games buttons (figure 6). A simple ring detect procedure might be:

```
DEF PROCringdetect
REPEAT UNTIL (ADVAL0 AND 3)=1
PROClatch(1)
ENDPROC
```

and a similar function for the carrier signal (which must be checked regularly) might be:

```
DEF FNcarrier
IF (ADVAL0 AND 3)=2 THEN =1
ELSE =0
```

The circuitry for passing the carrier detect is similar to that for the ring detect. If you have any worries about your competence to handle modem circuitry, then it is best to leave well alone. British Telecom do not approve of DIY modems adding extraneous (and possibly lethal) voltages to the phone lines, so remember get a BT-approved modem, or an acoustic coupler; keep any modifications between the modem and the computer; do not introduce voltages or shorts to the phone lines.

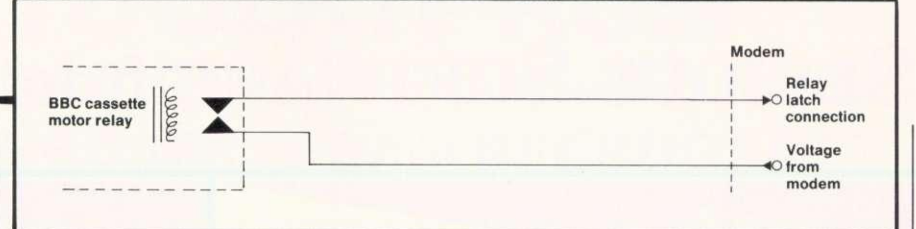


Figure 5. Latching the relay in the modem for auto answer

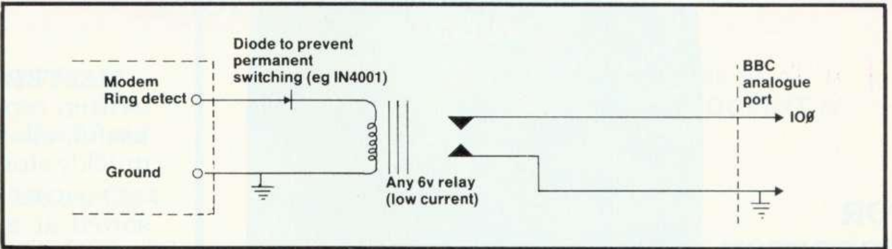
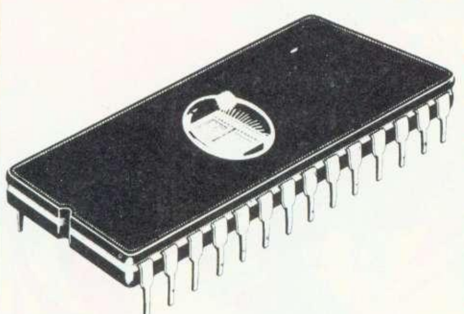


Figure 6. Passing the ring detect to BBC micro (for carrier detect, signal would go to IO1 on the analogue port)



TOOLKIT ROM

BASIC Programmer's Aid for the BBC Micro from BEEBUGSOFT

It is possible to program in BASIC without TOOLKIT but its not very smart

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EDUCATIONAL COMPUTING MARCH 1984

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TOOLKIT is an indispensable aid to Basic programming on the BBC Micro. It gives instant access to a set of powerful utilities held in ROM.

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TOOLKIT features an extremely powerful editor, allowing the use of cursor keys to list a program line-by-line in either direction and move to any part of a program to overtype or insert new code and corrections.

TOOLKIT also contains a powerful facility to trap an error in a Basic program as it runs. It will then automatically enter the Screen Editor, display the line in error and position the cursor at the statement at fault.

COMMANDS

*CHECK	Verify a program or data in memory with disc/cassette.
*CLEAR	Clear all variables including integers.
*EDIT	Enter full screen editor.
*FREE	Display free memory and pseudo variables
*HELP INFO	Displays various useful system information.
*MEMORY	Display memory contents.
*MERGE	Merge two programs.
*MOVE	Move program to run at specified address.
*NEW	As New, but can be issued from within a program.
*OFF	Cancel enhanced error handling.
*OLD	As Old, but can be issued from within a program.
*ON	Auto error handling – enters editor at line in error.
*PACK	Efficient program compactor.
*RECOVER	Intelligently recover bad programs.
*RENUMBER	Allow partial renumbering.
*REPORT	Extended error reporting facility.
*SCREEN	Screen dump to cassette or disc.
*UTIL 1	String Search.
*UTIL 2	String Search and Replace.
*UTIL 3	Move Basic program lines.
*UTIL 4	List Procedures and Functions.
*UTIL 5	List values of A% to Z%.
*UTIL 6	List Numeric Variables.
*UTIL 7	List String Variables.
*UTIL 8	List Names of Arrays.
*UTIL 9	Set up range for Utilities 1 and 2.

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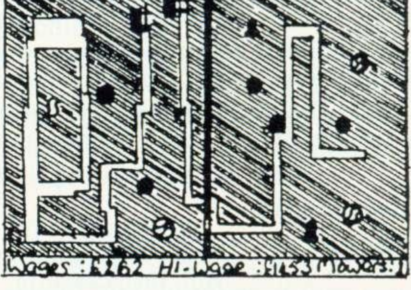
BEEBUGSOFT is the Software house of BEEBUG Publications Ltd.

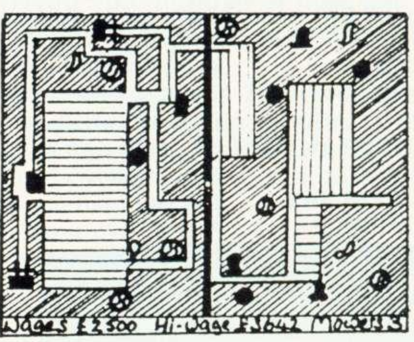
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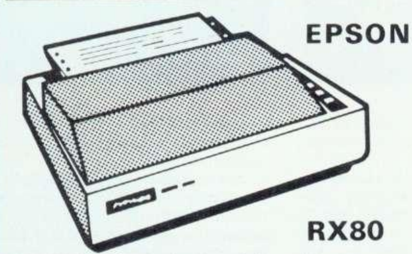
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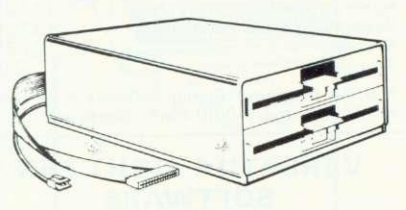
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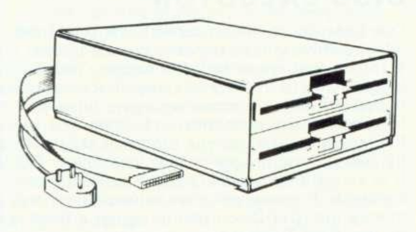
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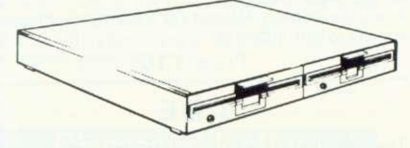
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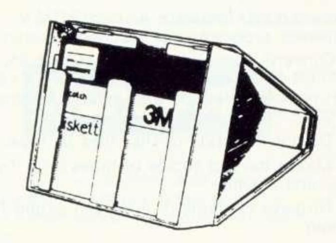
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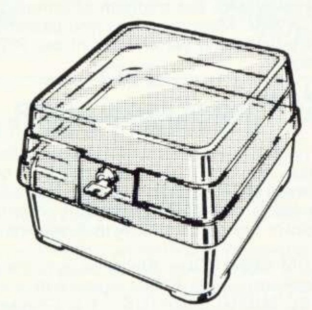
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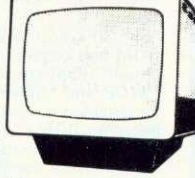
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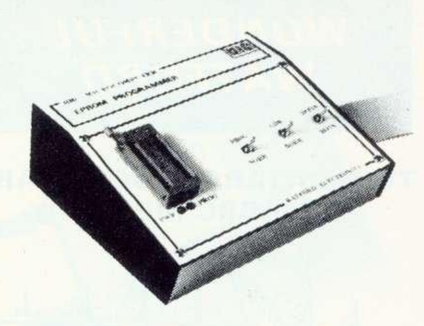


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ONLY **£89** incl. Manual (£3 carr.)

TEX EPROM ERASERS

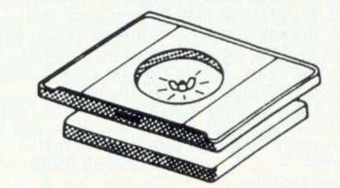
EPROMs need careful treatment to survive their expected lifetime. Rushing it could burn their brains out. So cop-out of this helter-skelter world; take it easy the TEX way and give your chips a well earned break. Cool, gentle and affordable. EPROMPT does it properly.

Two versions available:

- **EPROMPT EB** – The standard version. Erases up to 16 chips. **£30.00**
- **EPROMPT GT** – Erases up to 28 chips. Has an incorporated safety switch which automatically switches off the UV lamp when the Eraser is opened. **£33.00**

Spare 'UV' Lamp bulbs. £9

SWIVEL MONITOR BASE



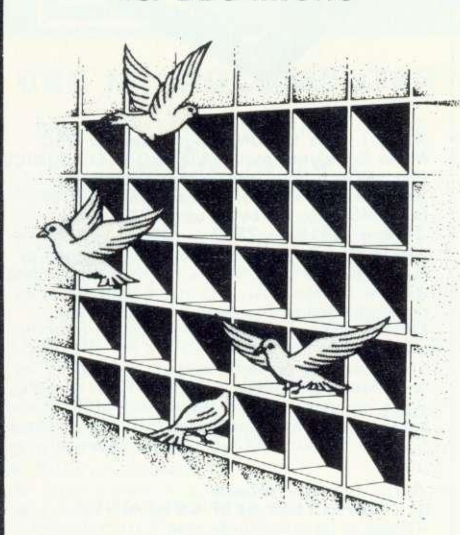
Attractively finished in beige, our swivel base allows you to tilt/swivel your Monitor to any required angle for comfortable viewing.

ONLY **£18**



WONDERFUL WATFORD

TWO DATABASE SOFTWARE for BBC MICRO



DISCDATA

At last for BBC Micro Disc users, Watford Electronics have produced 'DISCDATA' which must be the most versatile general database at the price on the market. The length of your files is restricted only by the space on your disc. You can have upto 20 fields with 'page' length records of upto 254 characters. The program is completely menu driven obviating reference to a manual although written guidance is given with the program. Add and delete records, amend title, field names and records, sort on any field and search for any record or group of records in any field. You do not need to abandon or rewrite your files if you wish to add additional fields or extend the length of any field, the program will rewrite the files for you. Your files can be in any drive. Output can be in 40, 80 or 132 character width with Printer routines. Two forms of output are provided for horizontal for label type output and a tabulated output with title and headings. What is more, the selected fields can be placed in any order on the screen. In the horizontal mode you can scan backwards or forwards with wrap around effect. Output can be started or stopped anywhere in the file. There is automatic totalling on decimal fields and an automatic count of the number of records output.
Now with extra 3 features: Allows string search; Calculations can be done on numeric fields; Create Sub-Files from the main File.

On disc at **Only £15**

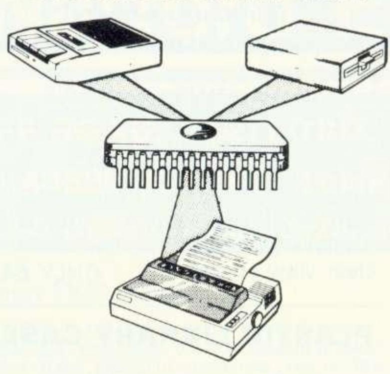
It has to be the best value.

FILE-PLUS

Now even more powerful with the added facility of a SHELL SORT on any field. This must make DATA-PLUS the most powerful and versatile Database to be found on BBC Micro.
A 16K ROM containing the most flexible and easy to use disk based Database system on the market. A database may occupy your total on-line storage capacity. You may design any number of data entry forms using a "paint" on screen technique. Forms may be upto 3 screens in size. A form may be used to Add, Delete, Update, Print and Spool records from your Database. Quick search facility on any text field. A query language provides full maths support (–, +, /, *, +–9999999999.9999) and compare facilities (=, >, <>, <=, >=, &, !) when used with the keywords – Assign, Compare, Display, End, Goto, Iff, Ift, Print, Read, Search, Spool and Update. Full printed output control via embeded commands. Supplied with 70 page manual and fitting instructions.

Only £43

BUFFER & BACKUP ROM



A very versatile firmware. An ideal ROM for engineers, programmers, teachers, students, etc.

★ Converts your Sideways RAM to a 4K or 16K BUFFER for a parallel printer. (Uses * FX5,3). (You no longer require to purchase expensive (£100+) Printer Buffers.)

★ Dumps selection of Disc files to Tape.

★ Makes backup copies of tapes onto Tape, Disc and Hobbit.

★ Displays contents of a chosen paged ROM on screen.

★ Menu display on 'shift-break' using ROM Filing System.

★ Comprehensive Manual

Simply a give away at **£18**

In keeping with our tradition of bringing you the best in BBC Micro at prices you cannot refuse, we are launching yet another of our ROM based software.

NEW LAUNCH ROM MANAGER

This unique piece of firmware has been designed to allow the USER to access the BBC Micro's Sideways Rom Paging facility to the full. The 18 Commands our ROM MANAGER adds to your computer are concerned with 3 aspects of ROM use:
1. ROM CONTROL – Ability to activate at random any of the ROMs present in the Micro.
2. BBC MICRO's STATUS – e.g. Checksum on any ROM, and the Filing system currently active.
3. ROM DEVELOPMENT – Allows main memory to be used like Sideways RAM.
The Commands available are:
*CHECKSUM – generates a CRC for the specified ROM.
*DIRECT – allows you to pass a particular command to the specified ROM.
*EXAMINE – allows examination of the named ROM.
*EXPLAIN – gives detailed description of the first 22 FX codes.
*FILE – passes the command directly to the currently selected filing system.
*FUNCTION – displays the string currently programmed onto the function keys.
*INCLUDE – allows the main memory to be used for developing ROM software without need to purchase expensive sideways RAM.
*MODIFY – any location in memory is displayed and can be modified with this command.
*NAMES – displays the names of any resident ROMs.
*RAM – allows the command to be passed directly to the 'RAM based ROM'.
*REMOVE – turns off the 'RAM based ROM' option.
*SPECIFY and *DEFAULT – specifies the default ROM and passes the named command to the default ROM specified.
*STOP and *START – allows the named ROM to be disabled or enabled, preventing clashes between ROMs.
*STATUS – provides information about the ROMs inside the BBC micro, including the socket number, the name of the ROM, its length, whether or not it is enabled and supports language or service entry points.
*VALUES – outputs information concerning the status of ROM MANAGER e.g. the socket number it occupies, the number of active ROMs with a higher priority than itself, the current filing system.
*VECTOR – the same function as *DIRECT, but provided in case *DIRECT clashes with other ROMs.
In our opinion this ROM is one of the most useful utility ROMs available on the market, and is a must for anyone using ROM based software.

Introductory Price: Only **£19**

GEMINI'S BUSINESS SOFTWAR

Cashbook Accounts	£52
Final Accounts	£52
Invoices & Statements	£17.25
Commercial Accounts	£17.25
Mailing List	£17.25
Database	£17.25
Stock Control	£17.25
Home Accounts	£17.25
Beebcalc Spreadsheet Analysis	£17.25
Beebplot	£17.25
Payroll	£39

N.B. All the above Gemini software is on tape For Disc Based (40/80 track) please add £3.

VERSATILE LIGHT PEN SOFTWARE

- Enjoy, Explore, Educate!
- Pixil, Line, Character Definition
- Free hand drawing
- All Colours – MANY Special Effects
- Fill, Refill and Stripes
- User defined "Brushed Strokes" plus Character definer
- Grid, Scale, Perspective aids
- 2 TO 200 Points palletable in one Design with Circles and "RUBBER BANDING"
- Move design/character to any screen position
- Save and Load screens, User defined Graphic and line drawings for video titles, Own programmes, etc.
- Many Educational uses
- Instruction booklet included
- Full software support for "CUSTOM USE"
- Works with Watford, RH, Acorn User, DIY, and many other LIGHT PENS
- Available on DISC or TAPE

Price: Tape **£10;** Disc **£11**

DISC EXECUTOR

Disc Executor is a highly sophisticated disc utility which allows you to transfer all tape based software that we know of onto disc. You no longer have to throw away any of your cassette based software on acquiring a disc drive. It handles 'locked' programs and allows you to loa full length adventure type programs (i.e. up to & 6E blocks) and programs that load below &E00. It is very simple to operate (full instructions supplied). It saves you your valuable time and money too. Our Disc executor is not a Replica, its the 'Real Thing'.
Available in both 40 and 80 track discs. Please specify when ordering.

Price: **£10**

ADE

The complete program development package on 16K ROM. A must for all the Assembly Language Programmers.

Introductory price: **Only: £52**

GAMES SOFTWARE

CHESS	**£6.95**
CROACKER	**£6.95**
Escape from MOONBASE ALPHA	**£6.95**
CHUCKIE EGG	**£7.90**
FELIX in the FACTORY	**£6.95**
GALACTIC COMMANDER	**£6.95**
KILLER GORILLA	**£6.95**
MUNCHYMAN	**£5.95**
MOONRAIDER	**£6.95**
MUSIC SYNTHESISER	**£8.25**
PENGO (Watford)	**£7.75**
SWOOP	**£6.95**
Twin Kingdom Valley	**£8.25**
747 FLIGHT SIMULATOR	**£7.75**

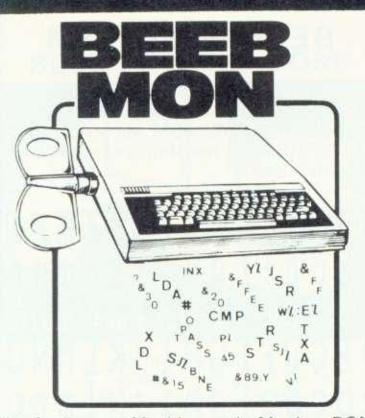
LEVEL 9 ADVENTURE GAMES

COLOSSAL ADVENTURE. The classical mainframe game "Adventure" with all the original puzzles plus 70 extra rooms. **£8.65**

ADVENTURE QUEST. Through forest, mountains, desert, caves, water, fire, moorland and swamp on an epic quest vs tyranny. **£8.50**

DUNGEON ADVENTURE. Over 100 puzzles in the Demon Lord's dungeons. **£8.50**

SNOWBALL. Save a 7000 location colony starship in 2302 AD. **£8.50**



Watford's own Machine code Monitor ROM
ritten by Andrew Bray (Cambridge), co-author
of the BBC Micro Advance User Guide.

he most powerful and versatile machine code onitor ROM yet written for BBC Micro. It has l the normal memory editing, moving and elocating facilities, plus all editing is with a full creen editor allowing scrolling up and down emory, entering in Hex, ASCII or standard ssembler mnemonics.
 use as a debugging tool, you run code under total emulation system. Everfelt a desperate rge to set a break point in ROM? No problem you can even have breakpoint on reading or riting locations in memory and on register ontents. The system fully supports debugging f sideways ROMs e.g. BASIC can fully and asily be run from within Beebmon and from here DFS and other sideways ROMs can be sed in total emulation mode.
eebmon can even run itself. In so doing you an nest Beebmon up to a level limited only by e memory size. Beebmon uses 256 bytes of orkspace, located anywhere in memory, even n the 1MHz Bus. Beebmon effectively uses no ero page workspace, so your program (e.g. ASIC) can use any or all of the base page. ow does it achieve this? By providing a 6502 terpreter all programs running under it exist a virtual BBC, so special memory locations ke the ROM latch are not actually accessed y your programs, instead they alter a location Beebmon's workspace. Emulation also lows immediate return to Beebmon command vel by ctrl-escape no matter what code is eing excuted at the time. All this exceptional ower and flexibility is complemented by a ear and detailed manual included in a value r money price of:

£22



scover the hidden secrets of BASIC and the PERATING SYSTEM with this easy to use ogrammers tool.
ROM based machine code Disassembler for e BBC micro. It enables machine code ograms to be listed in BASIC/DUMP format d thus is the perfect complement to the built ssembler. It allows Sideways ROMs, files on sk or tape to be listed, and also has a mprehensive editor, allowing mnemonics to be ered directly, as well as HEX, DECIMAL, ASCII d BINARY memory editing. There is also a full of labelling facilities available (up to 3,200 bels), with the major locations and routines eady labelled.
us DIS-ASM enables any monitor program, ch as BEEBMON to be used to much greater ect as it is not necessary to disassemble emory each time the display is altered.

ONLY **£16**

ice includes a comprehensive manual and ing instructions.)

Computer Concept's

Graphics ROM **£27**

CARETAKER

The New Basic Utility ROM from Computer Concept **£28**

DISC DOCTOR £26

A sophisticated Disc Utility ROM with many useful commands. (For detail description please refer to Computer Concept's advert in this magazine.)

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**



THE INVESTIGATOR

Now you can make up back-up copies of all your Discs. Put the precious originals away in the safe and use your duplicates.
See what your 8271 can do! With Watford's Investigator you can find out about track formatting, sector length, etc. Investigate your disc and then make up your back-up copy. Format your discs to your own individual specification! Find deleted Data! Spot unformatted tracks!
Disc based software includes a comprehensive manual.

Price: **£15**

(Please specify 40 or 80 track when ordering)

PENGO

The popular 100% machine code arcade game now at a special offer price of

Only **£6.95**

CRAWLER

A new challenge for your reflexes, exercise for your fingers. Crawler is the best yet BBC version of the popular arcade game "CENTIPEDE". Blast the voracious caterpillar before it eats you. Avoid the wandering spiders. Shoot the scorpions before they poison the mushrooms. Kill the descending fleas as they cause massive mushroom growth. This game is a delight to play. The controls are responsive and fast yet precise.

Only **£5.95**

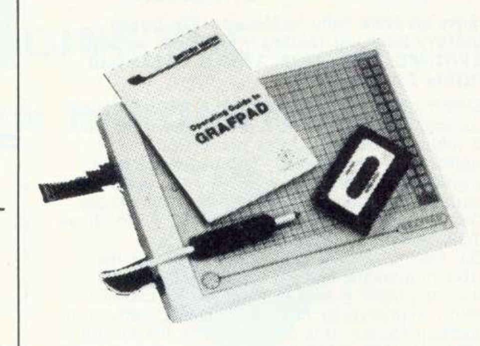
LIGHT PEN

Light Pen for BBC Micro including Software cassette and operating instructions.

Only: **£16**

WATFORD – Always a step ahead

GRAPH PAD



With this popular British Micro's Graph-pad, you can add new dimension to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

Price: **£125**

BEEBPLOTTER

The Unique Graphic Tablet

Watford Electronics' BEEBPLOTTER will work with 32K BBC Micro. Connects to Analogue port. The unique design makes it accurate and simple to use. Attractively finished. The comprehensive booklet supplied describes its use in detail and shows some of the possible applications.

The special features include:-

- Works in all graphics mode and any colour selectable.
- Commands printed on Tablet and On-screen instructions.
- Special routines enable pictures to be quickly loaded from tape.
- Works with all operating systems and ECONET. Tape and Disc versions available.
- Large drawing area (32cms x 23cms).
- Maps, Pictures and Diagrams produced quickly and easily.
- Transparent tablet enables maps and diagrams to be copied directly from books.
- Commands include line, circles and rectangle drawings, infilling, full editing and an easy to use copy and move feature.
- Screen dump routines included for Seikosha and EPSON printers.
- Routines are included to allow user to incorporate pictures in their own programs.
- Designed by a professional teacher with educational uses in mind.

At a knockdown price of:

ONLY **£59** (£3 carr.)

SURGE PROTECTOR Plug

Safely eliminates dangerous voltage surges. During a thunderstorm, a nearby lightning strike can induce high voltage spikes in the voltage supply or fluctuating loads can also result in transient overvoltages which if unchecked, lead to expensive data corruption/loss. Our surge protection plug will provide the necessary surge protection. Simply replace your standard 13Amp mains plug with the surge protection plug (which is almost the same size). Ideal for computers, Hi-Fi systems, precision instruments, fridge freezers, etc. Max. surge current 2KAmp; Max. Voltage 250 Volts. A must for all serious computer users.

Price: **£8.95**

WATFORD ELECTRONICS

Continued →

MK 2 13 ROM SOCKET EXPANSION BOARD

Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. This board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, etc. (At Watford, we think ahead.)

Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the Board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

ONLY £32.50 (carr. £1)

EPROMs & CMOS RAMs

2764-250nS (8K ROM)	**£5.95**
27128-250nS (16K ROM)	**£24.00**
6116-150nS (2K RAM)	**£6.50**
6264-150nS (8K RAM)	**£36.00**

BEEB SPEECH SYNTHESISER

Versatile Speech Synthesiser Unit for the BBC Micro



SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!

PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!

BUILT-in Library of approximately 500 words to get you started.

ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.

EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!

COMPACT unit – The whole system is built into a small case – easily tucked behind the computer. Auxillary output socket provided for direct connection to an external amplifier.

HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

Only £44

THE ULTIMATE DFS FOR BBC MICRO

by

Watford Electronics

Highly acclaimed at The ACORN and BBC MICRO USER Shows. What do the independent press say?

Good value for money – *Beebug Aug. '83*
A very worthwhile package – *The Micro User*
You'll be buying a very powerful package – *Personal Computer News*
Superior DFS; Excellent disc sector editor – *Computer Answers*

Without a doubt, the most sophisticated DFS Software yet written for BBC Micro Computer. This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

● The system can either use the ACORN standard 31 files per disc side or DOUBLE THE CAPACITY to 62 files. The size is selected at formatting time. Copying between discs with different catalogue sizes works perfectly normally.

● A FORMATTING PROGRAM is built in, permitting formatting to 35, 40, 80 track formats with either 31 or 62 files. Since the formatter is built in to the DFS it can be used without affecting whatever program you are using.

● A DISC VERIFIER is also built in. This checks the internal checksums on each sector to identify any corrupted data. This is extremely useful when saving valuable data as it shows faulty discs quickly and easily. Again it does not affect the program you are using.

● A built in DISC SECTOR EDITOR gives a screen window onto the disc enabling detailed editing of any byte on the disc. This is very useful for recovering accidently deleted files and can save weeks of work.

● A double step mode allows the User of 80 TRACK DRIVES TO READ & WRITE BOTH 40 and 80 TRACK DISCS. This mode is software selected for each drive individually, thus enabling a 40 track disc to be copied on to an 80 track very easily. THIS ELIMINATES THE NEED FOR EXPENSIVE 40/80 TRACK SWITCHABLE DRIVES.

● A WORKFILE function sets the name to be used when the null filename is issued. This allows a program to be edited and repeatedly saved having only typed its name once.

● When using LOAD, CHAIN, etc, it is possible to specify an ambiguous filename. This will result in the first file whose name matches the specification being used. This saves typing the end of a filename that you know is uniquely identified by its first few characters.

● Two commands exist to simplify the transfer of programs from TAPE TO DISC. These load the file to &1100, switch off the disc system and then move the file to its correct load address; thus saving a lot of complicated programming. This command can be used to load files up to 27K75 long.

● An advanced COPY command is included which will prompt the user, requesting whether to copy each file.

● RENAME has been extended to allow the use of ambiguous filenames. This allows you to change BERT1, BERT2, BERT3 to FRED1, FRED2, FRED3 with only one command.

● OPENOUT has been improved to give you fewer annoying 'Can't extend' errors, as it automatically picks the biggest space on the disc in which to put a file. A SPACE command lets you know how much space *COMPACT could create before you waste time doing it.

Continued:

BEEBFONT ROM

BEEBFONT is a remarkable new concept in BBC software, exclusively available from Watford. Once fitted, the 16K ROM will enable you to produce attractive text displays in following different styles:

ABCDEFGHIJKLMNO
abcdefghijklmnop
ABCDEFGHIJKLMNO
ABCDEFGHIJKLMNO
abcdefghijklmno
ABCDEFGHIJKLMNO
ABCDEFGHIJKLMNO
abcdefghijklmnop
ABCDEFGHIJKLMNO
ABCDEFGHIJKLMNO
abcdefghijklmno
ABCDEFGHIJKLMNO
ABCDEFGHIJKLMNO

★ **It works in modes 0, 1, 2, 4, using full colour.**
★ Simply use Ctrl–V to select the font and all further screen output will be in a new style.
★ Even the ordinary Beeb character set can be enhanced by doubling height or width and emphasising to give bold print.
★ A comprehensive editor is included which enables the user to design his own characters.
★ A spooling program is provided, which enables pre-formatted text files to be displayed on an EPSON FX, RX, and NEC Printers, using the full range of character styles. (Please specify printer type when ordering). Can be used with WORDWISE.
★ This really must be one of the most original and exciting products of the year.
★ A twenty page manual is provided and the demo/editor software comes on disc or cassette (please specify when ordering). **ONLY £3**

DFS continued:

● 2K of RAM can be reclaimed from the DFS by setting "PAGE" to & 1100.

Now with extra features:

● The powerful library system has been extended so that libraries now work on all accesses not only *RUN. This allows you to ha a utility directory with all your commonly used programs without muddling in your current workfiles. Very useful for BCPL User.

● Programs can now reside lower in memory reclaiming some of the DFS' workspaces, inde PAGE can be taken as low as £1100 under m circumstances.

● To make DFS easy to use, wild cards ("*") have been made vastly powerful, e.g. *INFO *A gives information on all files in the current directory which have an "A" anywhere at all in their filename.

● Comprehensive and clearly written Manual (available separately) gives the user a complete package deal.

● Fully compatible with BBC TELETEX and TORCH Systems.

DFS ROM ONLY £2
Complete Disc Interface Kit including DFS ROM and fitting instructions. £9
Comprehensive and clearly written DFS Manual. **£7.50 (NoVA**

P.S. We will exchange your existing ACORN DF or PACE (AMCOM) DFS for the highly sophisticated Watford's DFS ROM for **ONLY £**

Watford's DFS is exclusively available from Watford Electronics. We DO NOT retail through any Dealers.

WATFORD'S BEEB PRINTER ROM



e you fed up with not being able to unravel your nter manual and use all those features you paid ? Need sensible paging for use in the creation of oklets? Then you certainly need our Beeb Printer M.

machine code printer utility in ROM.

'Single' key operations replace control code quences for underline, font and size selection, per movement, etc. Up to 30 come pre-defined, thout effecting normal fn key usage.

This rom allows easy control of your inter from 'Within' WORDWISE text. stead of long escape sequences, you just C' a single number to Select, Underline, int Styles, etc.

Automatic fanfold page margins. Puts gaps in tings. PRINTed text etc to skip the folds. The gap e alternates to minimise paper wastage when ing binders.

Form feed and related commands, made ailable on ALL printers. Can also provide a left argin.

User defined characters embedded within text e printed as on VDU.

★Commands select option for GP100, STAR, EC, MX/FX, LP VII/DMP100, DMP200. perates with Parallel and Serial Printers.

Fully functional with the popular WORDWISE ordprocessor.

upplied complete with a comprehensive 50 page manual.

Price: £24

(When ordering, please specify printer type)

NEW LAUNCH DUMPOUT 3

highly sophisticated machine code ROM oviding screen to printer dumps in any mode, s window setting utilities and two new WORD calls that allow you to use the Beeb aphic coordinate system for plotting or testing de 7 'pixels'.

IMAGE Ultra sophisticated dump of any aphic screen, using up to 8 tones. ndles **FULL MODE 7 text,** graphics, uble-height and colour and mode 8. 14 tional parameters, using 'prefixing' so that you ly need specify the ones that you want. The rameters include:

V<scale>, H<scale>. These are both 2 byte mbers giving you very fine control over the mp size from minute to enormous. Unlike her dump Roms, scale does not vary with reen mode.

R <0-3> Dump rotation 0, 90, 180, 270 grees.

I<indent> Set gap from left edge of paper.

X <min> <max>, Y <min> <max>. The area the screen dumped is that in the graphics ndow, alternatively these parameters may be ven.

P Physical colour values used for dumping. therwise use a negative scale, i.e. white prints rkest.)

T Two tone dumps for higher resolution.

M <mask> 8 bits controlling colour masking.

E Contrast expansion. Makes mode 7 text aracters and separated graphics stand out ore clearly from the background.

C All mode 7 graphics printed as reduced size umps.

*GWINDOW Draws graphic window on reen, its size and position can then be altered sing the cursor keys.

*TIMAGE <indent> Does a fast, text only ump of the text window in any mode.

*TWINDOW As GWINDOW but for text.

UMP OUT 3 gives you ALL of the GIMAGE cilities listed above and GWINDOW in mode 7 s well, not just hi-res modes.

deal for CP80, GP80, DP100, GP250, STAR, AGA/TAXAN, NEC, SHINWA, CP80, GEMINI, PSON MX/RX/FX, LPVII, MP100/120/200/400 Printers. omprehensive Manual included.

Only: **£19**

WATFORD JOINS THE COMMUNICATION REVOLUTION

MODEM 84

APPROVED for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use.



With the launch of Watford's MODEM 84 you can now hook into PRESTEL, MICRONET, HOMELINK, TELECOM GOLD, etc., for about the cost of a good tape recorder. Prestel gives you access to an incomparable database covering almost every subject under the Sun. There is Micronet with lots of free programs that you can download and run. Details of Clubs and User groups, a diary of meetings and exhibitions, news and reviews, technical information, etc. There is Homelink with On-line banking. And there is armchair shopping, travel information, Entertainment, World News, Sports News, Business News, Weather information, Electronic mail and lots more. The basic Prestel subscription is only £5 per quarter for domestic user and at off-peak times there is no charge for access time. Can you afford not to be part of this revolution?

Now using the latest techniques and the new generation of Modem chips, Watford have developed a Modem that is newer, better and yet cheaper than any on the market.

Compare the Specifications:

MODEM

- Direct-connect Modem using BT approved isolation components.
- Full Duplex V23 operation for Prestel and TELECOM GOLD operation (1200/75 Baud).
- User-to-User half duplex 1200/1200 Baud operation with AUTOMATIC SEND/RECEIVE switch (BEWARE – most MODEMS switch manually between send and receive, which precludes the use of intelligent user-to-user software).
- Simple single button operation and comprehensive LED status display.
- Attractively finished. Sized to sit on the Disc drive.

NEW SUPER PRESTEL INTERFACE ROM

Fully compatible with Watford's MODEM 84 as well as with PRISM and most other Modems.

- Supports full Prestel Colour Alpha and Graphic Characters including Double Height, Flashing, Conceal/Reveal.
- Called by simple *PRESTEL command. Disc and Tape configurations fully supported.
- Telesoftware downloader included.
- Comprehensive MAILBOX facilities including offline editor.
- Auto Logon sequence, can be burnt into ROM if desired.
- Unique "TAG" facility allows tagging and recall of interesting pages – avoids the common and annoying 'NOW WHERE WAS THAT PAGE' problem.
- Page load and save to tape or disc. Pages are automatically saved under Page Number reference in a 'FRAME' directory.
- Print page options are ASCII only (i.e. with supression of Graphics) – fast and works with any printer – as well as a full graphics dump for the popular Epson printer.
- 'USER' function call built into interface with specialist add-on routines (your own as well as ours).
- All the above facilities available from Function Keys. An overlay is provided giving simple yet comprehensive guidance to the key functions.
- Comprehensive instruction manual supplied.

PRICES:

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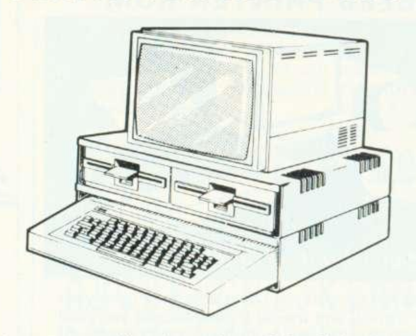
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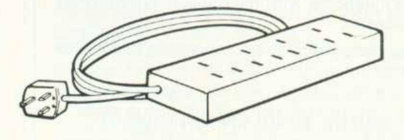
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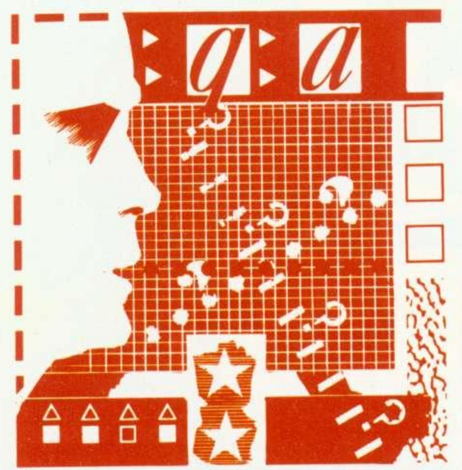
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Martin Phillips dispels negative INKEY confusion, presents a vertical printing method, and nurses his Beeb back to health

Testing the keyboard

HERE is a question that is straightforward enough but the answer leads on to an exploration of some features of BBC Basic that I know confuse many. David Cameron of Bradford understands what INKEY does followed by a positive number in the brackets, but asks for help with the negative INKEY statement. The subject is something the handbook does not explain fully. It is actually quite easy when you know how, but, as is usual with the BBC (and of course the Electron), there's usually a great deal more hidden round the corner!

INKEY (X) where X is a negative number enables you to see whether a particular key is pressed at that instant. This is most useful as it is possible not only to test those keys that have an ASCII number associated with them, such as the numbers or the letters of the alphabet, but it also allows the programmer to test for keys such as the copy key or the shift key which have no ASCII code.

As always, the best way to see how it works is to try a few examples. Listing 1 (see page ii) uses a REPEAT . . . UNTIL loop to keep testing the keyboard and ends when the space bar is pressed; −99 is the number for the space bar. A full list is given in both the Electron and BBC user guides. What the user guides do not mention is that if the appropriate key is detected, a value of −1 will be stored in A, and a value of 0 if the key is not detected. Those who intend writing programs on their BBC for the Electron beware! Some of the negative INKEYs do not exist on the Electron. The Electron has no TAB key, no SHIFT LOCK, and negative INKEY cannot be used to detect the Electron's function keys. Neither can the following be detected in this way on the Electron: ^, \, @, [,].

When listing 1 is run, if several keys are pressed before the space bar is pressed the string of characters will be printed when the program ends. To avoid this, include line 80:

```
80 *FX15, 0
```

This will clear the keyboard buffer, where key presses are stored temporarily before being processed by the computer. Listing 2 is a rearranged version of listing 1. This saves having to use a variable (A) and saves a line of typing, and hence some memory space.

Listing 3 shows how INKEY works with a positive number in the brackets. The positive number represents the number of centiseconds (hundredths of seconds) the statement will wait for a keyboard response. In the case of listing 3 it will wait three seconds. If no response is made in the time allowed, a value of −1 is returned in the variable A. If a key is pressed, then the ASCII number of that character is returned. There is a list of ASCII numbers in both user guides. These are not the same values as the negative INKEY numbers (couldn't be that easy). The ASCII number for the space is 32. Using INKEY in this way is a useful way of creating a pause in a program.

Listing 4 shows another variation on the 'testing the keyboard for the space bar' theme. This program uses the GET statement, which will halt the program until a key is pressed. Listing 5 is very similar, except that GET$ is used. GET returns an ASCII number corresponding to the key that was pressed, GET$ returns the ASCII character itself.

Finally, listings 6 and 7 are procedures to print a message at the bottom of the screen in reverse text and wait until the space bar is pressed. Two versions are needed, one for modes 1 and 4 and the other for modes 2 and 5. A third version would also be needed for mode 0, but has not been included here. The reason for the different versions is the differing size of print between the modes. The long strings of VDU codes in listing 6 have the following meaning:

VDU 24,175;10;1100;60; Define a graphics window at the bottom of the screen.
VDU 5 Join the text and graphics cursors.
VDU 18,0,131 Define graphics colour (GCOL0,131). In this case the background colour. White in modes 1, 4 and 5, yellow in mode 2.
VDU 12 Clear the graphics window to the colour just defined.
VDU 18,0,0, Define black as the text colour.
VDU 18,0,128 Set background colour back to black.
VDU 18,0,3 Set text colour to be white in modes 1, 4 and 5, and yellow in mode 2.
VDU 16 Clear graphics area.
VDU 4 Separate text and graphics cursors.
VDU 26 Restore default windows.

Lines 10030 and 10040 need not be two separate lines. They were split to make the procedure more readable.

To rewind or not to rewind

BOB BARRETT of Belfast says he was horrified to read my advice about not rewinding cassette tapes after use (*Acorn User*, February). This, he says, could lead to cassette tapes becoming slack and then when re-used winding themselves round the cassette mechanism and being destroyed.

I stand by my advice. The problem of tape winding itself around the spindle of the cassette recorder is much reduced with the use of short-length computer tapes. In fact I can't remember it happening, although it often happens with the long C90 audio tapes. My main reasons for suggesting that the tape is not rewound is that I have

IF YOU have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre. London WC2E 9JH.

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frequently seen inexperienced users rewinding the tape by pulling out the connecting lead to make the cassette motor work. This quickly destroys the cassette lead and/or cassette socket. In any case with many programs it is not easy to stop the program, use the *MOTOR command and rewind the cassette. Not rewinding cassettes has caused no problems for me, but I always use C12 or C15 tapes. Also, if a backup copy is made of tapes, it is cheaper to risk the occasional loss of a cassette than to keep replacing cassette leads.

Mr Barrett also bemoans the fact that there was no *FX command to alter the inter-block gap on cassette files. Acorn in fact allows this to be changed, not using a *FX command but the *OPT3 command. The inter-block gap can be altered from 0.1 to 12.7 seconds on loading. The default value (the value normally set by the computer) is 2.5 seconds. It is not possible to change the inter-block gap using a *OPT or *FX call when saving data files. The *OPT command is mentioned on page 398 of the user guide.

Tape loading problems

Mr PROVAN of Glasgow has been writing programs on his computer, saving them on tape and then trying to load them on another computer without success. Even using the same cassette player he gets block and data errors. The only way he can transfer programs at 1200 baud is to make a tape copy using a twin tape copier and use that.

The fact that a program loads after it has been copied on a stereo copier suggests that the fault lies in the different record or playback levels expected by each computer. Several circuit changes were made to the cassette interface on early and not-so-early BBCs.

This is a problem for the dealer to sort out. It might be necessary to take both computers in to find which (or both) is incorrect. The dealer should be aware of the changes made on the earlier computers and should be able to modify yours and bring it up to the latest standard.

A window on printing

J SUMMERS asks for a way of printing text vertically on the screen. There are several methods, most relying on taking each letter in turn (this can be done using the MID$ statement) and printing it vertically using the TAB statement, or by using VDU5 to join the text and graphics cursors and then using the MOVE statement to position each letter. There is another, not very obvious, way that is much easier. You define a text window one character wide and print the word inside the window. Each letter will appear under the previous one. The text window can be cancelled using VDU26.

Listing 8 draws two axes and labels each one to show the technique. It will work on both the Electron and the BBC. Line 100 has been inserted to move the prompt and the cursor out of the way when the program ends. The left-hand edge and the right-hand edge of the window have the same value.

On the subject of text windows, I have had several comments from readers unable to define text windows in mode 7 on the BBC. The problem, I suspect, is that the window has been defined too large, so that the window simply defaults to the whole screen. Mode 7 has only 25 lines in common with modes 3 and 6, as opposed to 32 with the other modes. Remember too that it starts at line 0 and ends at line 24, and the first character is positioned at column 0 and the last character at column 39. This has caught me out several times!

A text window one or two characters wide can be defined to have some of the mode 7 control codes embedded. Then if a window is defined as the size of the rest of the screen, the screen can be cleared or scrolled without affecting the control codes.

For some useful effects, try listings 9 to 14. Reference will need to be made to the section on mode 7 control codes in the user guide.

```
 10 REM Listing 8
 20 MODE 1
 30 MOVE 100,1000
 40 DRAW 100,100
 50 DRAW 1200,100
 60 VDU28,0,10,0,1
 70 PRINT"Vertical"
 80 VDU26
 90 PRINTTAB(28,31)
    "Horizontal";
100 PRINTTAB(0,30)
```

Listing 8. Demonstrates technique of printing a character within a text window

Listing 9 shows how a title can be placed at the top of the screen and remain there while the rest of the screen scrolls. This effect will work in other modes too, although the double-height facility cannot be used.

My computer loses its spark

FOR the past two months, writing this feature has been very difficult, and my faith in the Beeb has been shaken. My trusty computer has started letting me down. The troubles started shortly after I fitted a couple of new ROMs onto my sideways ROM board. By now it is beginning to get rather full. When I was using Wordwise the computer suddenly developed a creative spirit of its own and started adding words, phrases and characters here and there.

I found a cure by taking the top cover off the computer. Ah, overheating! I hear wise readers thinking – but no,

Listings 9-14 (see also overleaf). Useful effects with text windows in mode 7

```
10 REM listing 9
20 MODE 7
30 FOR N=0 TO 24
40 PRINTTAB(0,N)CHR$131;
50 NEXT N
60 VDU28,1,24,39,0
70 FOR N=1 TO 10
80 PRINT"HELLO"
90 NEXT N
```

```
10 REM listing 10
20 MODE 7
30 FOR N=0 TO 24
40 PRINTTAB(0,N)CHR$(130+N MOD 2);
50 NEXT N
60 VDU28,1,24,39,0
70 FOR N=1 TO 10
80 PRINT"HELLO"
90 NEXT N
```

```
10 REM listing 11
20 MODE 7
30 FOR N=0 TO 24
40 PRINTTAB(0,N)CHR$(129+N MOD 7);
50 NEXT N
60 VDU28,1,24,39,0
70 FOR N=1 TO 10
80 PRINT"HELLO"
90 NEXT N
```

```
10 REM listing 12
20 MODE 7
30 FOR N=0 TO 24
40 PRINTTAB(0,N)CHR$134CHR$141;
50 NEXT N
60 VDU28,2,24,39,0
70 FOR N=1 TO 10
80 PRINT"HELLO"
90 NEXT N
```

```
10 REM listing 13
20 MODE 7
30 FOR N=0 TO 24
40 PRINTTAB(0,N)CHR$129 CHR$157 CHR$132;
50 NEXT N
60 VDU28,3,24,39,0
70 FOR N=1 TO 10
80 PRINT"HELLO"
90 NEXT N
```

```
 10 REM Listing 14
 20 MODE7
 30 FOR N=1 TO 2
 40 PRINTTAB(9,N)CHR$141CHR$130;
 50 PRINT"EVERLASTING TITLE!"
 60 NEXT N
 70 VDU28,0,24,39,4
 80 REPEAT
 90 PRINT''"The title will remain even though"
100 PRINT'"the rest of the screen will scroll"
110 I=INKEY(100)
120 UNTIL 0
```

this fault was there when the computer was first switched on. I thought the trouble was a broken track on the keyboard circuit board because it happened only when I touched certain keys. After much eyestrain I gave up that avenue of thought and concentrated on the sideways ROM board. I wondered if it was, as Joe Telford had found, that the board was not sufficiently buffered and that adding the extra couple of ROMs had caused the fault. I removed these ROMs and a couple more for good measure but the fault was still there, although not so bad. Back to the drawing board.

By then the fault was getting worse. Listings would not print out, odd error messages appeared, programs corrupted for no reason, and even the disc drive refused to work at times. I got my multimeter out and started measuring voltages here and there. I was surprised to find that the output from the power supply was low, 4.80v when it should have been 5v. I checked the power supply connectors on the circuit board. Lo and behold, several of the spade connectors had dry joints where they were soldered to the board. I resoldered them, the voltage increased to 4.86v and the fault was cured – for a week.

Stronger measures were called for. I committed the sacrilege of soldering the power supply leads directly to the board. The voltage on the board rose to 4.91v, and again the fault disappeared, this time for a couple of hours, but when the computer warmed up the fault reappeared. In went the multimeter probes again, recording voltage on the sideways ROM down to 4.75v. This needed a drastic remedy. I cut off the two pins that carry the power supply from ROM socket to sideways ROM board, wired the power supply direct to the ROM board and added a small electrolytic capacitor. Voltage 4.9v. This cure seems to have worked and my confidence in my trusty Beeb is returning.

If this was the real fault, then it is probably not just buffering problems on the sideways boards but also low supply voltage caused by drawing too much current down tracks never designed to carry such current. This will affect most boards similarly as they become more populated, or as the ROM socket into which they plug works loose. Also it appears that the fast-on power lead connectors will cause trouble as the computer ages, and soldering might be a cure. However, this is not a tip for the beginner or the newcomer to soldering. It could cause a lot of expensive damage. If in doubt take it to a dealer.

Loading machine code

R P LANE of Chippenham was trying to copy a machine code program onto his BBC micro in the way shown in April's Hints & Tips. All went well until near the end of the program, when the screen started filling up with odd signs and characters.

What happened was that the free memory space in the computer was full and the program continued loading, overwriting the screen area of memory. Assuming the program will load and run on a BBC, I would guess that Mr Lane has got a computer with disc interface or Econet interface. When either or both of these are fitted they reserve some memory for their own use, leaving less for the user. If Mr Lane tried to load a long program in there would not be enough room.

All is not lost. If you are not using disc or Econet the memory space reserved for either of these filing systems can be recovered and used for other purposes. To do this type PAGE = &E00 and press RETURN. This restores the memory as though you had a tape-based computer. Many programs on cassette check to see if PAGE is different, and change it back again so that when running the program it will load and run without problem.

Some cassette programs that do not check the value of PAGE will not load on machines with disc or Econet fitted and again will work only if PAGE is altered as above. PAGE is the position in memory where a program is to start loading. By altering PAGE it is possible to load two or more programs into the computer (provided they are reasonably short) and quickly switch from one to the other. For example, type PAGE = &E00 and enter a short program and check that it runs (one or two lines is sufficient to play with). Now type PAGE = &3000 and type in another short program and run that. Return to the original PAGE by typing PAGE = &E00 and you should be able to run the original program. On returning to PAGE = &3000 you will still find your second program in residence and this can also be run again.

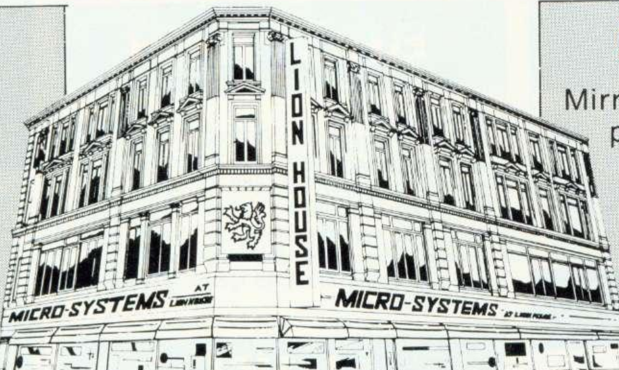
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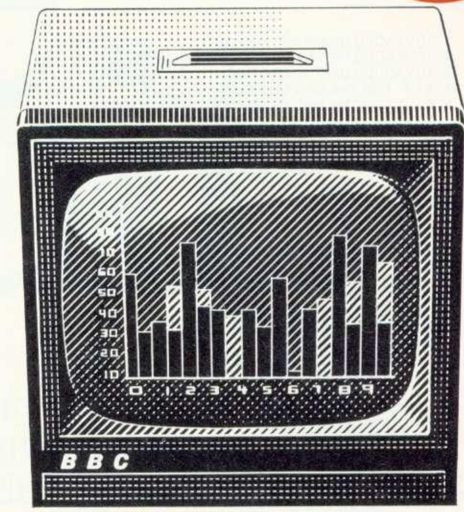
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ELECTRON LEARNER

Tessie Revivis starts off our new regular 'welcome pack' section

SO YOU'VE just opened your Electron box. Great – but what next? Yes, you've taken delivery of the lovely micro you've heard so much about. And there's a funny-looking plug, a black lead of sorts, an introductory cassette and a big book. A quick flick through this *User Guide* looks a bit daunting, with all those diagrams, and you see lots of numbers – and you're no good at maths!

Here's some sound advice from the *Hitchhiker's Guide to the Galaxy:* don't panic! The *User Guide* may look daunting at first sight, but it really is easy to understand, and you don't even need to know the answer to 2+2 to read it or program your Electron.

Before getting started, make a bit of room for yourself, preferably on a table with a couple of mains sockets within a few feet of you. You'll also need to commandeer the television set. A spare portable set is preferable, otherwise you'll have to use the family telly, but be diplomatic and let the rest of the family finish watching *Dynasty* first. You'll need to be polite about it because you'll want to use it again in the future. It doesn't matter whether the set is black and white or colour. Colour is nicer to view but black and white performs just as well.

Take your Elk (that's its nickname by the way) from its polystyrene casing. It's light but pretty robust (try not to drop it, though). Place it on the table with the keyboard facing you. This looks very much like a typewriter keyboard, but it has a few extra keys, some of which have odd-looking symbols on them, but we don't need to worry about these yet.

Lay your hands on the keyboard and try pressing a few keys at random. You'll find that you don't have to apply much pressure to depress them. The great thing about programming a computer like the Elk, though, is that you don't have to be a typist.

Look either side of the casing. On the left you'll see four largish round sockets and on the other side of the case a single small socket. On the underside of the case, directly beneath the set of four sockets you'll see the words 'UHF TV', 'VIDEO', 'RGB' and 'CASSETTE'. These each relate to the function of the socket above. Note the position of the one marked UHF TV – we'll need to connect the TV to this one.

Place the computer in front of the TV set, which should be switched off. To connect the TV to the Elk you'll need the thick black lead supplied. Remove the aerial connection from the TV and plug one end of the black lead into the empty aerial socket. Which end? Well, only one end will fit. The free end can now be plugged into the UHF TV socket that we identified earlier.

Next, we need to connect the Elk to the mains through that odd-looking plug called a power supply. The small round plug at the end of the wire fits into the small single socket on the right-hand side of the Elk. Push the plug end of the power supply into the mains socket and switch on. You should hear a small bleep from the Elk and a small light should be visible on the left-hand side of the keyboard just below the key marked ESCAPE.

Plug the TV in to the mains and switch it on. You'll probably see a poor quality picture of the channel it is presently tuned to. The volume control of the TV can be turned right down, as we don't need sound. To see the picture produced by the Elk the TV must be tuned into the computer's channel. If you have a dial-type channel selector rotate this to about the 35 point; adjust it carefully about this point and you should find the Elk's picture. If your set has a push-button or infra-red channel control you'll need to program one of the buttons. Refer to your TV manual to do this. Again, the channel needs to be set to 35 or 36 and fine-tuned.

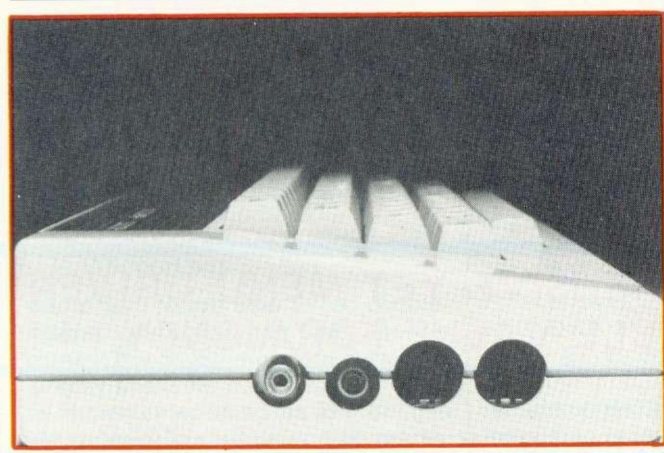
Now you're ready to start programming! No, sitting in close proximity to the TV can't give you radiation poisoning, as several old wives' tales suggest. I've been sitting in front of mine for the last year and I've still got three arms! It's a good idea, though, to take a break every half-hour or so to give your eyes a rest.

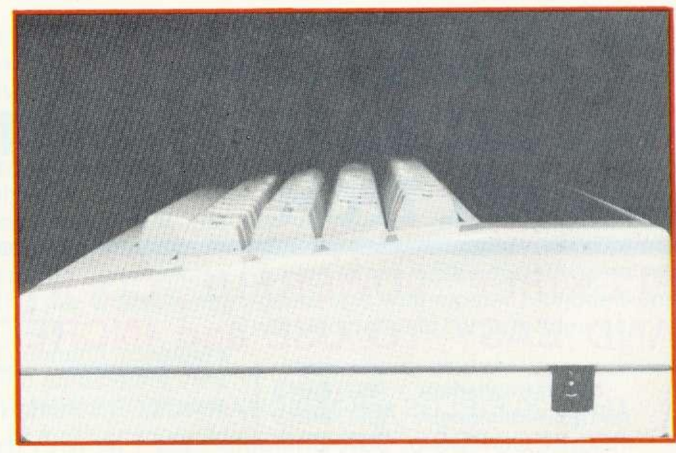
Try typing a handful of letters on the keyboard. As you press a key it will be displayed on the TV screen. Now press the key marked RETURN, located on the right-hand side of the keyboard. This acts like the typist's carriage return bar, but it also informs the computer that you've finished entering the line and you want it to have a look at what you've typed in. You'll probably



Above – Power supply lead and Electron-to-television lead. Below – Electron keyboard with 'micro on' indicator light below the ESCAPE key







Sideways views of the Electron showing (left) sockets for TV, video monitor, RGB monitor and cassette, and (right) power supply

see the word 'Mistake' displayed. The Elk printed this on the screen because it could not act on what you typed in – it was not a valid command.

To get rid of what you typed, push the key marked BREAK at the top right-hand side of the keyboard. Don't be afraid to hit this if you need to wipe the screen clear, you'll do no harm. Try it again and press BREAK a few times.

Type the following in:

```
VDU7
```

pressing the keys V,D,U and 7 in that sequence. Now press the RETURN key to 'enter' the letters into the Elk. Did you hear a bleep? If so, you have just entered your first command into the Electron using BBC Basic. This command simply told the Elk to play a short note on its own speaker.

Let's now enter our first program. Type the following in exactly as it appears:

```
10 MODE 5
20 MOVE 1000,0
30 PLOT 85,1000,500
40 VDU 7
```

Remember to press the RETURN key at the end of each line to enter it into the computer. Don't worry about making a mistake – you can't hurt the computer. If you make a mistake simply press the RETURN key and retype the line.

Notice that each line of the program begins with a number. These line-numbers serve the important function of telling the computer the order in which to enter the program into its memory system. Low line numbers come before high line numbers.

Interspersed between the line numbers and each command, and in the middle of some of the commands, are spaces, entered by pressing the space bar on the keyboard, the long key at the bottom. The reason for entering these spaces is to make the program neat and readable. You could leave them out altogether or insert two, or three or more spaces instead of one.

To see the effect of this program we need to tell the Elk to execute each instruction. This is called running the program. Type in the word RUN and press the RETURN key. *Voilà!* You should now see a large white triangle drawn on the lower half of the screen – and did you hear the beep?

To clear the screen press the BREAK key, as before. To get our short program back we must enter two commands. To remind the computer it has a program in its memory (it does forget sometimes) type OLD and then press the RETURN key. The Elk now recalls the program you entered and will print it on the screen if you type LIST (remember to press the RETURN key). You can now run the program again if you wish.

You might want to re-type it without the spaces to see if they do have any effect on the way the programs operate.

Now you might feel more ready to tackle the *User Guide* and work through the many examples it contains. Start at the beginning and don't skip sections that look a bit overpowering. Programming isn't particularly hard if you try each item out. Try experimenting by changing each program slightly. You won't harm the computer and you can always stop things by pressing the BREAK key.

CONVERTING BEEB PROGRAMS TO RUN ON THE ELECTRON

WHY aren't there more programs for the Electron in *Acorn User*? It's nearly all for the BBC. The Atom gets good coverage. So why not the Electron? This is one of the questions that readers constantly ask *Acorn User*. The fact is that in an average issue perhaps about 75 per cent of the so-called Beeb material will also run on the Electron with little or no conversion. So let's see how all you Elkies can go about the B to E conversion where it needs to be done.

First, it's worth making a list of the main differences between the two machines so that problem areas can be established. They are:

- No Mode 7 and teletext graphics on Electron.
- No 6845 cathode ray tube controller chip on Electron.
- Only one SOUND channel on Electron.
- Operating system calls.
- No hardware for 'direct' interfacing on Electron.

In most instances the first item on our list will be the only real reason for program surgery.

Look at the program you want to convert. Does it include the command MODE 7? Remember this is the default mode for the Beeb so that even if no mode is specified an initial CLS will have the same effect. Unless the program is specifically about teletext (and is therefore unconvertible), this mode is probably being used to take advantage of double-height and flashing characters for titling purposes. Transferring these into mode 6 should be straightforward. Colour can be achieved effectively using the COLOUR command.

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If the program uses mode 7 it will almost certainly include teletext control codes, which will normally be in the guise of CHR$ commands. For example, the lines:

```
150 PRINT CHR$ (141): CHR$ (129):
    "Acorn User"
160 PRINT CHR$ (141): CHR$ (129):
    "Acorn User"
```

would print *Acorn User* in red double-height characters on the Beeb's screen. The double-height facility is not directly available on the Elk but could be implemented using the user defined characters. Printing in red is readily performed using COLOUR 1. Figure 1 lists all the teletext control codes that you are likely to encounter.

The fact that we are using the Electron's mode 6 has another side-effect. It uses 6k of memory, as opposed to the 1k required by the Beeb's mode 7. If the program is purely textual, say an adventure game, we have to squeeze it into a smaller memory. For converting programs from *Acorn User* this problem should not arise as listings this long are not normally published in the magazine. However, inefficient programming can drastically increase the amount of workspace below HIMEM required by the program. Consider the Basic lines:

```
10 REPEAT
20 x$ = x$ + "£"
30 y$ = y$ + "+"
40 UNTIL LEN x$ = 255
```

The program occupies about 50 bytes but, believe it or not, when run it will require more than 7700 bytes of memory to operate! If running a program ever results in a 'No room' error have a good look through it for this sort of inefficiency.

The Beeb's graphics are handled in a different way from the Elk's. On the Beeb they are controlled by a specialist chip, the 6845 CRTC (cathode ray tube controller), plus a video ULA to provide the colour palette. The 6845 is a memory-mapped device and it is possible to program its registers to achieve rather stunning effects, such as instantaneous screen scrolling, left, right, up or down! The 6845 is not incorporated into the Elk. Instead a ULA chip designed specifically for the Electron combines the BBC's two chips, but it lacks programmability. In other words sideways scrolling is not instantly available.

There is no reason why you should not write your own procedures to perform these functions, but they really need to be in machine code, and even then they would not have the instantaneous effect of the 'hardware' scrolling. For details on the 6845 see the April issue, page 26. To aid your conversion, figure 2 helps you identify the commands the Beeb uses to access the 6845.

SOUND and ENVELOPE are both scaled down on the Elk. Four sound channels are incorporated but the micro can drive only one channel at a time. This means you can't synchronise notes on the Elk using the '&' prefix, eg, SOUND &201, −15,20,20.

The Envelope command considers only the first eight parameters; the remaining six are ignored. In general there's no reason to make changes to these commands when converting a program, but don't expect a concerto written for the Beeb to adapt readily.

Most of the operating system commands specific to the Beeb's 1.2 MOS have been implemented in the Electron's MOS. However, there are differences between them, although so far Acorn has not released a comprehensive list. Obviously OS calls that refer to items such as analogue to digital converters or the RS423 serial interface are less likely to have been implemented than others. In most instances OS commands will be directly transferable.

Hardware-specific programs will not, of course, run on a bare Electron, but most of the hardware specific commands are implemented in the Electron's Basic – ADVAL, for example.

Because of the Electron's popularity an increasing number of peripherals are becoming available. Sir Computers has been offering a printer and joystick interface for several months and Acorn's own Plus 1 (see the news section in this issue) will be available within a month or two (fingers crossed!). Decide on your printer by reading the reviews by George Hill that have appeared in *Acorn User* over the last year, then take advantage of all of the utilities he has provided.

So, as you can see, it should in many instances be a painless task to do the B to E conversion. A look into the May issue, for example, reveals that the following three programs will run directly on the Electron with no conversion: *Doodle Bug*, page 83; *The Fantastic Four*, page 96; and *Circles, Diamonds and Squares*, page viii.

Heaven's Date (page iii will run, though you would probably want to convert lines 30 to 100 to look tidy on a mode 6 screen. Similarly, Joe Telford's *Sober Statistician* can be converted to run on a tape-based system as he suggests, and with mode 7 to mode 6 conversion it should perform admirably.

CHR$ (129)	Alphanumeric red
CHR$ (130)	Alphanumeric green
CHR$ (131)	Alphanumeric yellow
CHR$ (132)	Alphanumeric blue
CHR$ (133)	Alphanumeric magenta
CHR$ (134)	Alphanumeric cyan
CHR$ (135)	Alphanumeric white
CHR$ (136)	Flashing text
CHR$ (137)	Steady (non-flashing) characters
CHR$ (140)	Normal-height characters
CHR$ (141)	Double-height characters
CHR$ (145)	Red teletext graphics
CHR$ (146)	Green teletext graphics
CHR$ (147)	Yellow teletext graphics
CHR$ (148)	Blue teletext graphics
CHR$ (149)	Magenta teletext graphics
CHR$ (150)	Cyan teletext graphics
CHR$ (151)	White teletext graphics
CHR$ (152)	Conceal display
CHR$ (153)	Contiguous graphics
CHR$ (154)	Separated graphics
CHR$ (156)	Black background
CHR$ (157)	New background
CHR$ (158)	Hold graphics
CHR$ (159)	Release graphics

Figure 1. Teletext control codes

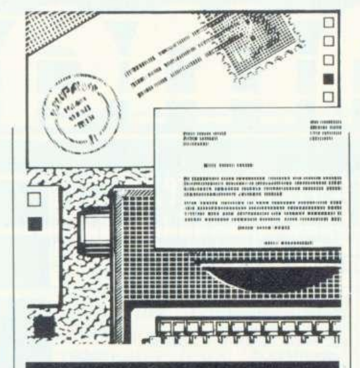
```
VDU 23,0,R,X,0,0,0,0,0,0
   where R = Register
   and   X = Value to be written to 6845

&FE00 = Address register
&FE01 = Register file

*FX 151,0,Y = Write Y to address register
*FX 151,1,Y = Write Y to register file
```

Figure 2. 6845 CRTC programming commands





How Joe missed the point

Sir, The idea of a statistics package, as started by Joe Telford in your May 1984 issue, is welcome.

Joe wants to see whether data confirm Bill's hypothesis that in darts games 'men were scoring less on each throw when playing a lady opponent'. He finds the correlation coefficient, r, showing 'a moderately high correlation of +0.829, apparently proving Bill's theory'. Unfortunately Joe used an inappropriate technique. The correlation doesn't reflect differences between the two measurements in a pair, but only whether they tend to go up or down together in a particular way. Joe shows that for the following four pairs of numbers, r=1, the biggest it can possibly be:

	X	Y
item a	1	4
item b	2	5
item c	3	6
item d	4	7

If the four items were four men dart players, and X and Y their average scores against lady and men players respectively, it does indeed look as if Bill's hypothesis is supported. But the correlation coefficient would also be 1 with the following results:

	X	Y
item a	1	1
item b	2	2
item c	3	3
item d	4	4

which certainly don't lend credence to Bill's idea.

Commonsensically, we should look at the differences, average score vs men – average score vs ladies, for each player. Out of eight players, seven scored more against men, which is already evidence favouring Bill. The mean excess of score vs men over score vs ladies is 8.6, with standard error 1.8; this is very strong evidence that Bill is correct.

But of course, as Joe says: '... A more important question is how valid was the actual data.' For a start, the fact that the two types of opponents are referred to as 'men' and 'ladies', the one not being the natural opposite of the other, leads the reader to suspect that something more than skill at darts is being compared! I hope Joe enjoyed collecting the data.

Wendy Fox
London

Horrors of statistics

Sir, In your May issue Joe Telford constructed a statistical package for testing the hypothesis that male dart players score less when playing a lady than they do against a male opponent. Now, Joe is a talented chap; his programming skills will already be well-known to your readers but here we find he is also a meticulous field worker in this important area of social research. Unfortunately, all expertise has limits. His breezy adage 'Get the data right and the rest is easy' suggests a serious underestimation of the horrors of statistics. Accordingly, the data were analysed in quite the wrong way for testing his hypothesis.

Each dartsman furnished a pair of scores: a score against lady opponents and a score against other men. With eight players, we had two sets of eight figures to compare. Joe performed a correlation on these data, claiming that the closer the resulting correlation coefficient is to +1 the closer he would be to proving the chauvinistic hypothesis.

Perhaps the easiest way to see that this won't do is to imagine an outcome in which each player happened to score exactly the same in his two games – doing just as well (or badly) against ladies as he did against men. Obviously, the original hypothesis must be wrong here, but it is in just this case that the correlation is perfect at r = +1. Correlations consider relations between pairs of scores but not the particular relation Joe is after. Scores are 'correlated' across conditions (ie, different opponents) when individuals maintain their relative standing within the whole group. So the high positive correlation for these data means only that the high scorers against men were also the high scorers against ladies. This is useful information about the consistency of players when judged against each other – it says nothing about the effect of different game conditions on the absolute level of scoring. Nevertheless, I am pleased to say that application of the appropriate test, Students 't', reveals support for the hypothesis.

The rest is still not 'easy', even when we have got the data right and got the analysis right. We must still interpret our findings. I have discussed these results with some of my colleagues and have aroused considerable interest. As Joe is based just down the road from us, perhaps he would be interested in some collaborative research combining expertise. There is a large group of people here unusually anxious to go out and collect more data. I can't understand it.

Dr Charles Crook
Psychology Department
University of Durham

We've passed your letter on to Mr Jottings, who will, we're sure, do a statistical analysis on it down at the P&G.

Deep joy

Sir, I recently bought the new Acornsoft *Aviator* program and must say that it is one of the most impressive simulations around, providing hours of enjoyment.

The program is best appreciated by using a joystick. To my home-brewed joystick I've added a further touch of realism by extending the stick with a two-foot length of plastic pipe half an inch wide and on the end I've mounted a plastic grip like one from a bicycle handle. On the top of this is a small push button wired to the push button on the joystick handset.

When mounted on the floor between your feet the whole thing is a unique experience.

Chocks away!

A Katz
Edgware,
Middlesex

Looking good

Sir, I patiently awaited my May copy of *Acorn User*, which I have only just been able to obtain because it appears to have been published much later than usual. May I say that the new-look magazine is a vast improvement. I am also very glad that we shall be able to obtain tapes of the programs published. I hope that you will be able to topple the other monthly magazine 'Micro User' from its ABC pedestal!

J G Manley
Rochester, Kent

'Acorn User' should be available in your newsagent on the third Thursday of the month preceding the cover date. For example, this issue came out on the third Thursday of June, ie June 21.

At last, a new wave of games

Sir, A few weeks ago I was seriously considering writing a letter to your magazine in which I was going to complain about the amount and quality of software for the BBC micro. We constantly read articles about 'the fantastic BBC computer' and its 'excellent sound and graphics facilities', and when the BBC was first released Acornsoft provided ten to 20 high-quality programs, most of which were pure arcade copies. But then they sat back and left it at that, and other software houses seemed to follow their lead and not produce any better-than-average programs for six to 12 months. What I want to ask the software houses is, Where are the *Manic Miners* and the *Atic Atacs* of the BBC?

The letter I intended to send was all written out when I received April's issue of *Acorn User*. Upon opening it I found that Acornsoft had released a flight simulator, *Aviator*, Program Power had just released *Ghouls* and *Jet Power Jack* and Superior Software had

ASK a silly question, pass a fair comment, stage an angry protest – we don't mind what you write to us about (or about us!). Keep 'em short, keep 'em sweet, but keep 'em coming! The address is: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

brought out *Battletank* and *Overdrive*, so it seems that somebody else had noticed the lack of good, new software for the Beeb and had pressed the software houses to get underway again. I wait pensively for the reviews of these new additions.

The letter from 'A Pirate' forced me to comment that software houses are cutting their own throats by charging high prices for their software. If the prices were lower when the software was first released, people would not have the same incentive to copy software, but if prices are dropped now, the pirates will merely take advantage of making even cheaper copies of programs.

I read with great interest the article on the 6502 second processor, and would like to know when the other second processors are to be released. Also, do you know of any plans to release a 32-bit second processor?

David Edmondson
Whitworth, Lancs

No doubt by now you've read all about the Z80 in the June issue (page 26). This is, in theory, already available, although your dealer may not stock it until Acorn has cleared its order list. A 32-bit second processor is being planned but no release date has been fixed yet.

Steadier for the Star

Sir, With reference to George Hill's ingenious mode 7 screen dump program (*Acorn User*, March), owners of Star printers have undoubtedly found the hard copy produced by this program to be distinctly 'wobbly'. I discovered that the simple and effective remedy is to insert the control code 'ESC 85,1' (in the form VDU1, 27, 1, 85, 1, 1) at line 195. This turns off the Star's bi-directional printing and so results in a much neater and more regular printout (two examples enclosed).

It's a good idea to re-enable the bi-directional printing just before the end of the program, with a 'VDU 1, 27, 1, 85, 1, 0' at line 335.

Keep the great magazine going!

David C Sheasby
W Midlands

Getting the error codes right

Sir, In the May edition of *Acorn User* you published a letter from Mr P Hinchliffe at the end of which he made a call for a complete list of error codes and messages. Having looked into this recently I submit the following information that may be of use to him.

To quote the *Advanced User Guide*: 'The BRK instruction forces an interrupt which is interpreted by the operating system as an error. As part of the error handling in Basic the programmer can incorporate an error number and an error message into his code to identify the error. The byte in memory following the BRK instruction should contain the error number. The error message string should follow the error number and must be terminated by a zero byte'.

As the error number is a single byte it is true that there are 256 possible errors and messages. However, Basic uses only 44 and these are listed in the *User Guide* on page 482. 'At line xyz' is not an error, merely additional information that is appended to the error message using the variable ERL to indicate the line in which the error occurred. Furthermore, error number 60 does not exist.

The operating system uses 15 error codes, but not all of these are listed in the *User Guide*. The following nine are not included and in addition I can find no trace of error numbers 217 (header?) and 220 (syntax).

Error number	Message
213	Locked
214	File not found
215	Bad ROM
247	OS 1.20
249	Language?
250	Key in use
251	Bad key
252	Bad address
253	Bad string
254	Bad command

There are three errors with code 0, though I am not sure whether they are valid errors. Their messages are:

Silly
Remember space
Line space

As indicated by code 247, the OS error numbers and messages refer to OS 1.20.

David Abbot
Horsham, Sussex

Seriously . . .

Sir, I would like to criticise your magazine for not reviewing utility programs and ROMs. Your magazine is full of charts and reviews of the most useless games, but this is not useful to serious programmers.

I have a copy of *MASS* by DDT Software and have been using it for two months. For anybody writing serious machine code it is one of the most useful utility ROMs available. It is a powerful and flexible assembler which brings a quantum leap to machine code programming on the BBC micro.

I hope other readers get the opportunity to judge for themselves by way of a review, soon.

Roddy Maddocks
Brighton

We like nothing more than to please, so we hope the ADE ROM review on page 137 is up your street.

Confessions of a tape copier

Sir, For the last few months I have been reading the letters concerning software piracy with a great deal of interest.

One thing I have noticed is that some people think that every pirate copy of a program means £9.95 less for the software company. This is not a true conception.

I have certain pirate programs in my collection that have been lent to me by other people (and 99 per cent of software users have copies in their collection, as well they know it). I borrow a tape, copy it and return the original but that does not in any way mean that I have conned the software house out of any money. Indeed, of the programs I have copied I would not have purchased at least 95 per cent.

The fact is that too much software of poor quality is being produced with too much clever advertising. Ten pounds for one game is far too much and so many games turn out to be dead boring anyway.

In fact, there are programs of a fair quality around, but it is virtually impossible to tell which is good and which is run-of-the-mill rubbish.

While we are on the subject, your magazine doesn't help the matter by publishing a classified free ad page. For a start, every ad that says 'swap' means, I imagine, swapping copied software.

No, I am not a hardened pirate yet, and I have as many original programs as pirate copies. One third of the programs I have paid for I don't like at all, one third I put up with and the rest I like – the same applies for copies.

It is time software companies made their prices realistic (Acornsoft especially), provided software on disc and not just on tape, stopped lying about their games – and magazines stopped publishing ads from pirates who use the cover of swappers.

By the way, I think your magazine is the only BBC magazine to provide any true professional journalism, and the new layout and format is much better (my old *Acorn User* magazines always fell apart).

B McBain
Wisborough Green, W Sussex

'Proper' management

Sir, With reference to your article 'Database Menu Grows' (page 10, *Acorn User*, May) please be advised that my *proper* database manage-

CEEFAX 153 Wed 11 Apr 13:04/01

Weather eye

forecast for
24 hours from
noon:



Scotland, N Ireland,
N Wales and N England
will have showers and
sunny periods.

The rest of England and
Wales will have a little
rain at first, becoming
brighter and mainly dry
with clear periods
overnight.

Temperatures: Normal in
south, cold in north.

A neater print-out on Star, by David Sheasby

ment system has been on the market since before January.

I say proper because it enables the user to create a whole scheme involving up to 20 or 30 files, which are inter-related. Each file can contain approximately 1800 records and each record 20 fields in up to 512 bytes.

The software (which includes a lot more than the above) is supplied on 80 track disc, with a full manual for £60.

P S Horner
Simon Computer Services
York

Legal lists

Sir, I would like to correct a comment in the article about the Data Protection Bill (May edition, page 16).

The writer states that there is no clause excluding home computers. This is not entirely correct as section 33(1) makes specific mention of domestic and other limited use but goes on to qualify the section with sub-sections a,b and sections 33(2-6).

Home computers are used for many purposes, membership/mailing lists for local clubs among them. But if sections 33(2,3) of the Bill become law, it appears to make holding such a list illegal unless the members of the club have been asked individually if they do not object to the information being kept in this way.

In addition, the definition of 'data' as given in section 1(2) could be made, with a stretch of the imagination, to fit Addressograph-type cards which can be put through an automatic label-printing machine, as nowhere in the Bill is the word 'electronic' mentioned!

'Cobbled together' certainly seems to sum up the Bill and if home computer users are not to be caught up in this bureaucracy then some representation should be made to the Home Office to strengthen the existing clause on exclusion of home computer users. Alternatively, leave section 33(1) as it is, alter section 33(2) by deleting the first line, and delete sections 33(33-6).

So, home computer users, get hold of a copy of the Bill (Bill 159, ISBN 0 10 315984 3), digest it and write to your Member of Parliament.

D S Buckley
Harrow,
Middlesex

Need help to find your way round the computer scene? Kitty advises you



Q I am writing to you for unbiased advice as a total computer novice, and also for assessment of educational software. Living overseas, I have no access to a helpful club or organisation, and I am uncertain as to whom I should address my queries; I don't know of any general or educational computer advisory services in the UK but I am sure they must exist.

We bought, some time ago, a BBC model B computer and it remains virtually unused. We only have the *User Guide* and some magazines to guide us, and we really do not understand it at all.

Please could you recommend a good beginner's guide to computing? I have absolutely no prior knowledge of the subject; I want my computer to be a useful, approachable tool – I will never become a computer fanatic. I want it to enable me to quickly make a start in simple programming and to learn by correcting and expanding them as I go on. It will need to be clearly explained, in detail.

I have seen cassettes for sale which claim to debug programs. Do they work? What, if any, software would you recommend me to buy, to use over the year ahead?

My most urgent requirement is for a large file storage system. Which of all the data storage programs are, firstly, absolutely without errors, and secondly, give me the greatest storage space? Unless, of course, you can recommend me such a simple book that I can write my own program!

In addition to my own needs, my four-year-old son would love to learn to use the computer, and I am unable to guide him. Can you suggest material to teach such a young child about computing? I will be buying material to last a full year.

As a primary teacher, I want to encourage him to learn about computers and also to help his academic progress. Can you recommend any quality, published material, preferably written by educationalists experienced in teaching this age group, relevant to the needs of early primary children. I am not interested in computerised toy 'sums' and 'spelling' games that have been on the market for several years.

In detail, I am looking for material which covers some of the following concepts, or anything else which is suitable:

Early recognition of numerals and understanding of numbers (ie, 9=9) and that a given number, re-ordered, still totals the given number, obviously leading to addition, but I do not want 'sums' as such. Matching, one-to-one (ie, one cup to one saucer). Anything that encourages logical thought applicable to a 4/5 year old.

Pre-reading material. Left to right orientation (games that make the eye or finger follow across the screen from L to R, and subsequently to form a second line directly under the first). Also hand control/letter formation. Any material available which gives a child patterns or letter shapes to trace over on the screen, giving a reward for accuracy.

Early reading. I really want him to be just learning letter sounds, not names, in the lower, not upper case form.

I apologise for asking you so many questions, and I hope you will be able to answer at least some of them. I feel very out of touch with the computer world and what is going on in the UK.

Jennifer Booth
Abu Dhabi

A Where to start? First, clubs and advisory services. Try writing to some of the BBC user groups listed in previous issues; some of them will be happy to answer queries by post (they may have a joining fee, however). Groups that are specifically educational are MUSE, Freepost, Bromsgrove, Worcs B62 7BR; and the MEP, Cheviot House, Coach Lane Campus, Newcastle-upon-Tyne NE7 7XA.

There are several sound books that will introduce you to your BBC and to Basic. I recommend *BBC Basic for Beginners* by David Smith, published by Melbourne House, Melbourne House Castle, Yora House, Castle Yard, Richmond, Surrey TW10 6TS; *Easy Programming for the BBC Micro* by Eric Deeson, published by Shiva, 64 Welsh Row, Nantwich, Cheshire; and *Step-by-Step Programming for the BBC Micro* (books 1 and 2) by Ian Graham, published by Dorling & Kindersley, 1-2 Henrietta Street, London WC2. However, the only way to learn how to write programs is by typing in examples, boring though this is.

Debugging cassettes work only if you understand how to debug anyway – I don't think any of these products would be worth your while, at present.

Now on to databases. You ask about a 'large' storage system. Unless you have disc drives, no storage system can be large; using a database on a cassette system is also extremely time-consuming. You don't say what use you will be putting the database to, but I've found the following to be reliable: *Factfile*, published by Cambridge University Press, Cambridge; and *Masterfile*, by Beebugsoft, PO Box 50, St Albans, Herts. Why not write to these companies and ask what literature they have available?

As for educational software, there are two companies you could write to for their software lists. The first is Bourne Educational Software (BES), Bourne House, The Hundred, Romsey, Hampshire SO5 8BY; the second is ASK, whose products are distributed by Acornsoft, Betjeman House, 104 Hills Road, Cambridge CB2 1LQ. I do feel, though, that learning by computer is no substitute for learning from a person. Also, the best way for a child to learn about computers and computing is just by using a micro.

If you are interested in a fairly simple word processor for your own use, I would recommend Wordwise by Computer Concepts — it is very user-friendly and if you get on with it you can then graduate to more complicated WP software. Computer Concepts' address is 16 Wayside, Chipperfield, Herts WD4 9JJ.



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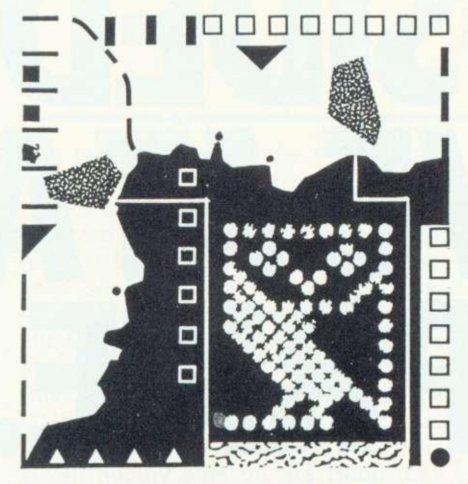
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Bruce Smith starts you off with advice on the Basic differences. Help from readers covers angled printing, Forth and the WP chips

How to sort out your Basic confusion

AN EVENING'S computing at a friend's house recently brought out some interesting 'problems' that Beeb users all over the country have encountered over the last six months. I'd taken some utility programs with me on disc, but they just wouldn't run correctly, throwing up all sorts of error messages. Back at home, though, the same programs functioned correctly.

It was only after some severe head scratching that (somewhat more sober) I realised I had been trying to run programs written in Basic II on a Beeb fitted with Basic I. While Basic I programs work with Basic II, the reverse is not the case, and the differences are not always as obvious as in the much-publicised commands OPENUP and OSCLI and the EQU functions. For example, the following program will produce a syntax error when run on Basic I

```
10 INPUT FIRST$, SECOND%; THIRD
```

The offender here would be the semicolon, for only commas are allowed as deliminaters in the Basic I INPUT statement. Replacing the semicolon with a comma solves the problem – a subtle difference, you'll agree.

A bit of investigation has resolved more of these naughty quirks. Here they are:

COUNT is a function used to hold the number of characters that have been printed across the screen. In Basic I it is unaffected by a mode change, but in Basic II it is zeroed by a mode change. The program:

```
10 PRINT "Acorn";
20 MODE 4
30 PRINT "User";
40 PRINT COUNT
```

would produce 9 in Basic I and 4 in Basic II, thus discrepancies in text formatting could occur.

The INSTR function is another command that can lead to a downfall. In Basic I the second string had to be shorter than the first for it to perform correctly, thus:

```
100 PRINT INSTR ("Lydia", "d")
```

would return 3, but the following will not work:

```
100 PRINT INSTR ("d", "Lydia")
```

Performing the latter in Basic II will result in INSTR returning the value of 0.

In Basic II the ELSE test can be used successfully inside functions or procedures as part of an ON . . . GOTO . . . ELSE or ON . . . GOSUB . . . ELSE structure, thus:

```
500 DEF PROC_Commander
    (branch%)
510 ON branch% GOTO 520, 530, 540
    ELSE GOTO 550
520 PRINT "A" : ENDPROC
530 PRINT "B" : ENDPROC
540 PRINT "C" : ENDPROC
550 PRINT "Failed!" : error% = 0 :
    ENDPROC
```

would not work in Basic I.

The EVAL statement is particularly useful for using the lexical analyser to evaluate expressions. This has been extended in Basic II to allow it to be used in conjunction with Basic's various pseudo-variables:

```
100 time$ = "TIME"
110 page$ = "PAGE"
120 himem$ = "HIMEM"
130 PRINT EVAL (time$)
140 PRINT EVAL (page$)
150 PRINT EVAL (himem$)
```

This is not possible in Basic I.

Basic II programs that manipulate strings can run out of memory, resulting in a 'No room' error when used with Basic I. This is because the allocation for string space in Basic II is more efficient than in Basic I. Amazingly, the following lines run in Basic I would eat up more than 3.75k of memory compared to around 0·25k in Basic II:

```
10 REPEAT
20 X$ = X$ + "!"
30 UNTIL LEN (X$) = 255
```

The ABS command has been recoded to allow the unary minus to take the absolute value of an integer value without bit 31 set. Therefore:

```
PRINT -ABS(1)
```

will work in Basic II but will return the error message 'Type mismatch' in Basic I.

The mnemonic assembler can be thrown into an acute state of confusion in Basic I if a line such as:

```
140 LDA ASC":"
```

is used. Though this is assembled correctly by Basic II. The Basic II assembler will now also display its disgust with a 'Bad DIM' error if you try the following:

```
100 DIM P% -2
```

These points should prove useful in converting Basic II programs to run on a Beeb with Basic I fitted. We'll pay a fiver for any relevant Basic II to I conversion tips we publish.

One of the seven deadly sins

ANDY CROWHURST of Portishead, Bristol, writes: 'In Beeb Forum recently you have devoted pages to auto-running Basic programs. Come off it, the word RUN obviously makes the interpreter jump to an address. Therefore *saving the program at this address will enable a Basic program to be *RUN. The syntax for Basic I is therefore

```
*SAVE "PROG" <PAGE>
    <TOP+1> BD2C
```

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Beeb Forum is a platform for ideas, tips and applications relating to the BBC micro and the Electron, intended for experienced programmers to share their thoughts. For every reader's tip published we pay £5 – or more for something special. Contributions should be typed or printed, with substantial listings on cassette. WRITE TO Beeb Forum, Acorn User, Redwood Publishing, London WC2E 9JH.

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This program can then be *RUN much more simply.'

This method does work but try the program on Basic II. It will load but not run. The Beeb has been provided with a very sophisticated set of operating system calls that if used correctly will allow programs written on any version of Basic to run on any other version of Basic. While jumping directly into the interpreter works it is not transferable and should be considered as one of the seven deadly sins on the Beeb (can anyone think of the other six?). We receive many programs that contain this type of illegal call into the interpreter and MOS, and this makes them unusable.

Machine code auto-run

PHIL COLLET of Banbury adds to the Basic program auto-run saga by providing a piece of machine code that will auto-run a Basic program when it is loaded and also when Break or even CTRL-BREAK are hit. It therefore has advantages over the normal *KEY10 method of programming the Break key.

The program (program 1, page vii) works by placing OLD <RETURN>, RUN <RETURN> into the REM statement of line 10, which initially contains 49 Xs. Lines 30 to 80 use the operating system to write to the Break intercept code and re-vector it to point to the REM-based machine code.

To use the program enter it as shown and then run it. Next delete all lines after line 60 and add or spool the Basic program onto the end of it. When complete save the lot with

```
*SAVE "NAME" <PAGE>
      <TOP+1> <PAGE+6>
```

On a disc system the program can be chained using *NAME and on a tape system *RUN"NAME".

A safety valve can be built in to allow CTRL-BREAK to work by adding a line with *FX247,0. The Escape key can be disabled with *FX200,1.

Finally, Phil Collet has a plea to Beeb owners to provide a means of recovering strings and string arrays after a Break. £10 from the Editor's wallet for the best solution.

Eccentric solution to string problem

CAMBRIDGE reader Philip Hazel writes:

There are a number of other approaches to J T Hindle's problem (Beeb Forum, April 1984), depending on whether the use of store or speed of execution is the more important factor. He has an array of values Z which depend on two values X and Y. His note does not say explicitly that all these values are integral, but this fact is obvious from his solution. Using a two-dimensional array Z%(X%,Y%) requires nearly 9000 bytes of memory, since the values of X and Y range from 1 to 47. However, the values of Z range only from 1 to 71, which led to his somewhat eccentric solution of encoding the data in a character string.

The first comment is that, since the values of Z are so small, a two-dimensional array of *bytes* cuts the store usage by 75 per cent (since each integer value normally uses four bytes). Unfortunately, Basic does not provide the facility of using arrays of bytes, but this can be simulated using the indirection operators and the ability of DIM to allocate store and return its address.

Program 2 shows how to set up a 47 × 47 array, with indices ranging from 0 to 46, and clear it to zeros.

A reference to element (X%,Y%) of the array is then written as Z?(X%*47+Y%). This method uses 2209 bytes of store but gives fast access to individual elements, and makes it easy to set new values. Indices 1 to 47 can, of course, be used instead of 0 to 46, but this requires more computation for each access.

A careful look at Mr Hindle's character string solution shows that, in his case, the values of Z are unique, and each possible value of Z occurs precisely once. In fact, it seems that the (X,Y) pairs depend on the Z value, rather than vice versa.

Mr Hindle's solution does not in fact store values of Z, but merely a succession of (X,Y) pairs in the right order. Because he uses the INSTR function to search the string, separator characters are necessary. These can be done away with if the string representation is changed to an array of byte pairs. The data than occupies only 142 bytes. Program 3 shows how one could set up the array, using his example data for the first few bytes, and program 4 is a function which returns the Z value corresponding to a given (X,Y), or zero if there is no such value.

Of course, the price paid for such close packing of the data is the time taken by FNZ to search for the (X,Y) values. If it is the case that the X or Y values (or both) increase as Z increases (which is true in the example above) then FNZ can be speeded up by stopping when a value is found that is greater than the one being sought. Alternatively, a technique such as 'binary chop' can be used.

Mr Hindle's problem is an example of a more general problem of how to store *sparse arrays* efficiently. If the 71 values of Z were not the first 71 integers, but arbitrary (possibly non-unique) values in the range 1–255, then, of the solutions discussed so far, only the two-dimensional array would work.

Angling text in multicolour

GRAHAM WALKDEN of Banchory, Kincardine, has sent a listing (program 5) allowing the users of the BBC A and B and Electron to produce multi-coloured, enlarged text at any position and/or angle in any graphics mode.

The routine works by printing the message to be placed on the screen, and using the POINT command to sense whether a pixel is to be plotted or

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SUPERPRINT Demo

NORMAL SIZED

Any Angle

FOR BBC MODE 4

OR BBC MICRO MODEL B

BY GRAHAM WALKDEN

not. Before the program will operate several variables have to be assigned.

M% – the number. The number of pixels in your particular mode has to be multiplied to produce either 1280 for the horizontal axis or 1024 for the vertical, eg, it is 2 in a 640 × 256 mode, 4 in a 320 × 256 mode and 8 in a 160 × 256 mode. Best results are obtained by using mode 1.
XMAG% – the horizontal magnification factor. One is normal.
YMAG% – the vertical magnification factor, 1 again being normal.
COL% – the colour of the characters to be printed (normal colour rules apply).
ANG% – the angle at which the text will be printed. Positive values cause the text to slant upwards, while negative values do the opposite.

To call up the routine you have to use a system of variable-assigned procedures, i.e. PROCPRINT ("Text to be printed", (X co-ordinate), (Y co-ordinate). So:

```
10MODE1: M% = 4: XMAG% = 2:
    YMAG% = 2: COL% = 2:
    ANG% = 2: PROCPRINT
    ("HELLO",640,512): END
```

will cause the word HELLO to be printed in yellow, upward-slanting, double-height, double-width lettering in the centre of the screen.

Superprint can be used for all sorts of purposes, and is considerably more effective than the mode 7 double-height lettering.

Arrays as parameters

IN HER ARTICLE 'Brush up on your writing' (April issue, page 111), writes Allen Hardy of Birmingham, Susan Jones describes some useful facilities peculiar to BBC Basic but observes that it is not possible, without using indirection operators, to write a general procedure using arrays because arrays cannot be parameters. The problem is also discussed by John Ryding (same issue, page 89).

Here's how to do it: the name of the array is passed to the procedure (or function) as the actual parameter, and EVAL is used in the procedure definition to evaluate the formal parameter. Program 6 calls Ms Jones' PROCWordin, rewritten as a function using an array parameter.

The function is similar to PROCWordin in that it repeats a question until you reply with one of the words in the DATA line. It returns the position of the word in the array (the index) to the main program, which prints it.

Unlike John Ryding's technique, this one can be used only to read arrays and not to write to them.

Showing the flag for Forth

RICHARD CLARKE of Croydon has some Forthright views. He writes:

It is rare to see items in *Acorn User* relating to BBC languages other than Basic or assembly language. As an Acornsoft Forth user, I hope to set a precedent for others to send in their ideas and thus make Forth more widely known.

Initially, Acornsoft Forth sets LIMIT, the top of memory pointer, to &5800 and allows you two mass-storage buffers (screens). If you are going to use only mode 7, memory from &5800 to &7C00 will be free. To take advantage of this, increase the top of memory pointer to &7C00 by:

```
31744 ' LIMIT !
```

and re-allocate storage for your buffers by:

```
n #BUF ! SETBUF FLUSH
```

where n is the number of buffers you want (see Forth manual, pages 81–82).

Now that you are using what would be screen memory in any other mode to store your source-code, you must take care not to change mode. This can be done inadvertently by EMITting 22, followed by another number, or TYPEing a string containing 22, which is quite possible if you are using TYPE on the wrong area of memory by mistake. I have found it very useful to prevent 22 being sent to the VDU drivers by the following:

```
DECIMAL : &EMIT DUP 22 = 26
    ?ERROR (EMIT) ;
ASSIGN EMIT TO-DO &EMIT
```

Now, 22 EMIT gives EMIT ? MSG #26. You can disable this by:

```
ASSIGN EMIT TO-DO (EMIT)
```

Multiple printing with Wordwise

JONATHAN EVANS of Plymouth points out that one of the limitations of Wordwise is that it does not have a facility for multiple printing. This can be very annoying, he says, if you want to run off a number of copies of a short document on fanfold paper. Program 7 provides a short Basic program to simulate this function.

First, design your document on Wordwise in the normal way and proof it carefully. Then save to disc or tape using option 8. This 'spools' the formatted text as an ASCII file (you will lose any special control codes to the printer for underlining etc when you do this). Then return to Basic and run the program. This will read your file into a single byte array and print it out for you as many times as required.

All formatting is preserved by the simple byte-by-byte PRINT CHR$ at line 280. For example, blank lines are coded as carriage returns (ASCII 13) which are automatically produced by PRINT CHR$ (13).

Automatic formatter in View

THE routine by Susan Jones 'Saving text for View' is a splendid idea, says Bernard Wilson of Ilkley. 'It certainly allows me to make better use of my own micro at home, using a View machine to format and edit the results.'

'However,' he adds, 'it is a bit tedious to have to press RETURN after each line, and forgetting to do so can ruin the whole text. I have improved the routine (see listing 8) to insert a RETURN and to format each line automatically, and to allow text generation in either Mode 3 *or* Mode 7 (invaluable if you are using a TV).'

More on sequential tapes

G A SMITH has some comments to make on P H Cowley's suggestion for running of programs in sequence on tape (April issue, page 58). He says:

Listing 5 will not work as shown. Line 1 appears to have been added after the program was tested, thus changing TOP-2 to &E31 rather than &E21. Either delete line 1, or change 0E21 to read 0E31. A neater, and more general, solution would be:

```
 2 LOMEM = HIMEM − &1000
 4 top$ = STR$-(TOP − 2)
 6 REPEAT
 8 DIM X% − 1:Y% = X%DIV256
10 $X% = "L.''''''''''' + top$
12 CALL − 9
```

'L.' in this case is, of course, an abbreviation for LOAD. 'CALL − 9' is a slightly cheaper way of calling the OSCLI at &FFF7.

Incidentally, 'CALL! − 4' is a useful way of generating reset, rather than the release-dependent call shown in January's Beeb Forum, page 69.

TOP OF THE LIST

Top of the List is a new regular feature in *Acorn User* in which we publish the most interesting, original or useful program received. Our first winner – we pay £25 for the one we publish – is Andrew Britton, who sent us a function key strip printer tested on the Epson FX80, MX80 and RX80 printers and the Star DP510. As it stands the program will print you a sample keystrip suitable for use with View. By editing your own items into the data statements you can define your own keystrips. To leave a key blank move on to the next item by adding a comma, as demonstrated in line 480 of the program.

Submitted listings should be no longer than 100 lines and authors should enclose a cassette or disc containing the program and, if it is to be returned, an sae.

Entries to: Top of the List, Acorn User, 68 Long Acre, London WC2E 9JH.

```
   10 REM *** FUNCTION KEY STRIP PRINTER ***
   20 REM *** BY ANDREW BRITTON          ***
   30 REM *** (C) Acorn User  July 1984  ***
   40:
   50 MODE 0
   60 PRINT "Function key strip printer (By Andrew Britton (C) 1984)."
   70 PRINT ''"Enter text in DATA lines at end."''
   80 PRINT''"Set up printer and press <RETURN>";:*FX 21,0
   90 REPEAT UNTIL GET=13
  100:
  110 n=12
  120 VDU 2
  130 VDU 1,27,1,64                  :REM Reset printer
  140 VDU 1,15                       :REM Condensed characters
  150 VDU 1,27,1,ASC"U",1,1          :REM Unidirectional
  160 VDU 1,27,1,ASC"3",1,16         :REM Line spacing 16:STAR/MX 24:FX/RX
  170:
  180 PRINT:PRINT
  190:
  200 FOR A%=1 TO 10:PRINT "+";STRING$(n,"-");:NEXT:PRINT "+"
  210:
  220 FOR L%=1 TO 3
  230 IF L%<3 PROCplin(2) ELSE PROCplin(3)
  240 FOR A%=1 TO 10:PRINT "+";STRING$(n,"-");:NEXT:PRINT "+"
  250 NEXT
  260:
  270 PRINT:PRINT:PRINT
  280 VDU 3
  290 END
  300:
  310 DEF PROCplin(n%)
  320 FOR z%=1 TO n%
  330 FOR N%=1 TO 10:READ A$:PRINT "!";A$;SPC(n-LEN(A$));:NEXT:PRINT "!"
  340 NEXT
  350 ENDPROC
  360:
  370 REM data limited to a maximum of 12 characters/field
  380 REM ***** Sample Keystrip For VIEW word processor *****
  390:
  400 DATA DELETE,NEXT,FORMAT,JUSTIFY,INSERT,DEFAULT,SPLIT,CONCAT,MARK,
  410 DATA BLOCK,MATCH,MODE,MODE,MODE,RULER,LINE,LINES,AS RULER,
  420:
  430 DATA MOVE,SWAP,RELEASE,DELETE TO,HLT,HLT,GOTO,SET,EDIT,DELETE
  440 DATA BLOCK,CASE,MARGINS,CHARACTER,1,2,MARKER,MARKER,COMMAND,COMMAND
  450:
  460 DATA FORMAT,TOP OF,BOTTOM,DELETE,BEGINNING,END OF,INSERT,DELETE,INSERT,DEL
ETE
  470 DATA BLOCK,TEXT,OF TEXT,END OF LINE,OF LINE,LINE,LINE,LINE,CHARACTER,CHARA
CTER
  480 DATA , , , , , , , , ,
```

	DELETE BLOCK	NEXT MATCH	FORMAT MODE	JUSTIFY MODE	INSERT MODE	DEFAULT RULER	SPLIT LINE	CONCAT. LINES	MARK AS RULER	
T	MOVE BLOCK	SWAP CASE	RELEASE MARGINS	DELETE TO CHARACTER	HIGHLIGHT 1	HIGHLIGHT 2	GOTO MARKER	SET MARKER	EDIT COMMAND	DELETE COMMAND
	FORMAT BLOCK	TOP OF TEXT	BOTTOM OF TEXT	DELETE END OF LINE	BEGINNING OF LINE	END OF LINE	INSERT LINE	DELETE LINE	INSERT CHARACTER	DELETE CHARACTER

See pages 51–54

Listings 1-5. Testing the keyboard for the space bar

```
10 REM listing 1
20 CLS
30 PRINTTAB(6,10)"Please press the space bar"
40 REPEAT
50 A=INKEY(-99)
60 UNTIL A=-1
70 PRINTTAB(15,15)"Thank you"

10 REM listing 2
20 CLS
30 PRINTTAB(6,10)"Please press the space bar"
40 REPEAT
60 UNTIL INKEY(-99)
70 PRINTTAB(15,15)"Thank you"

10 REM listing 3
20 CLS
30 PRINTTAB(6,10)"Please press the space bar"
40 A=INKEY(300)
50 IF A=32 THEN PRINTTAB(15,15)"Thank you"
60 IF A>32 THEN PRINTTAB(15,15)"Wrong key!"
70 IF A=-1 THEN PRINTTAB(15,15)"Too slow!"

10 REM listing 4
20 CLS
30 PRINTTAB(6,10)"Please press the space bar"
40 REPEAT
50 UNTIL GET=32
60 PRINTTAB(15,15)"Thank you"

10 REM listing 5
20 CLS
30 PRINTTAB(6,10)"Please press the space bar"
40 REPEAT
50 UNTIL GET$=" "
60 PRINTTAB(15,15)"Thank you"
```

Listings 6 and 7. Space bar test procedures for modes 1/4 and 2/5 respectively

```
   10 REM Listing 6
   20 MODE 4
   30 PROCspace
   40 PRINT"IT WORKS!"
   50 END
   60 :
10000 DEFPROCspace
10010 REM Mode 1/4 procedure to wait
10020 REM until space bar is pressed
10030 VDU 24,175;10;1100;60;5,18,0,131
10040 VDU 12,18,0,0
10050 MOVE200,47
10060 PRINT"Press space bar to continue"
10070 *FX15,0
10080 REPEAT:UNTIL GET=32
10090 VDU 18,0,128,18,0,3,16,4,26
10100 ENDPROC
```

```
   10 REM Listing 7
   20 MODE 5
   30 PROCspace
   40 PRINT"IT WORKS!"
   50 END
   60 :
10000 DEFPROCspace
10010 REM Mode 2/5 procedure to wait
10020 REM until space bar is pressed
10030 VDU 24,120;10;1160;60;5,18,0,131
10040 VDU 12,18,0,0
10050 MOVE180,47
10060 PRINT"Press space bar"
10070 *FX15,0
10080 REPEAT:UNTIL GET=32
10090 VDU 18,0,128,18,0,3,16,4,26
10100 ENDPROC
```

See 'Logging On', page 32

Program 1. Joe Telford's RS423 simulator

```
 10 REM SERIAL TRANSMISSION SIMULATOR
 20 REM J.TELFORD APR. 1984
 30 PROCinit
 40 REPEAT
 50   MODE7
 60   PROCmenu
 70   MODE4:PROCsetscreen
 80   REPEAT
 90     char=FNtype
100     IF char<>27 PROCsend(char)
110     UNTIL char=27
120   UNTIL FALSE
130 END
140 DEFPROCinit
150 VDU23,128,128,128,128,128,128,128,128,255
160 VDU23,129,255,128,128,128,128,128,128,128
170 VDU23,130,187,170,170,170,170,170,170,238
180 VDU23,131,143,136,136,136,136,136,136,248
190 VDU23,132,60,126,255,255,255,255,126,60
200 VDU23,133,60,66,129,129,129,129,66,60,
210 VDU23,134,0,62,8,10,106,138,138,107
220 DIM binary(12)
230 *FX220,0
240 ENDPROC
250 DEF PROCmenu
260 CLS
270 REPEAT INPUTTAB(0,5)"How many data bits/word? (7/8) "D%
280   IF D%<>8 AND D%<>7 VDU7
290   UNTIL D%>6 AND D%<9
300 REPEAT
310   REPEAT:INPUTTAB(0,7)"O(dd) E(ven) or N(o) Parity?   "parity$
320     parity$=LEFT$(parity$,1)
330     P%=INSTR("OENoen",parity$)
340     IF P%<1 VDU7
350     UNTIL P%>0
360   IF P% MOD 3 =0 AND D%=7 PRINT'CHR$131"7 bits and No Parity is
      not allowed.":VDU7
370   UNTIL P% MOD 3 <>0 OR D%<>7
380 P%=P% MOD 3
390 REPEAT:INPUTTAB(0,11)"How many stop bits? (1/2)        "S%
400   IF S%<>1 AND S%<>2 VDU7
410   UNTIL S%>0 AND S%<3
420 IF D%=8 AND S%=2 PRINT'CHR$131"1 stop bit only with 8 Data
    bits":S%=1:VDU7
430 PRINTTAB(0,15)CHR$131;CHR$136;"Press SPACE to Continue"
440 REPEAT UNTIL GET=32
450 ENDPROC
460 DEF PROCsetscreen
470 CLS
480 VDU19,0,4,0;0;0;19,1,7,0;0;0;
490  PROCrect(0,0,1279,1023)
500 PROCrect(320,866,224,96)
```

Continued ►

See 'Logging On', page 32

◄ Continued

```
510 PROCrect(736,866,224,96)
520 PRINTTAB(11,3)"CTS ";CHR$133
530 PRINTTAB(24,3)"RTS ";CHR$133
540 PROCrect(128,610,160,192)
550 PROCrect(128,610,160,96)
560 PROCrect(384,610,160,96)
570 PROCrect(384,610,160,192)
580 PRINTTAB(5,8)"CHR"
590 PRINTTAB(13,8)"ASC"
600 PRINTTAB(26,8)"BINARY."
610 PROCrect(736,610,416,192)
620 PROCrect(736,610,416,96)
630 PROCrect(128,354,416,192)
640 PROCrect(128,354,416,96)
650 PROCrect(736,354,416,192)
660 PROCrect(736,354,416,96)
670 PRINTTAB(8,16)"RS432"
680 PRINTTAB(27,16)"MODEM"
690 PRINTTAB(5,26)"SERIAL TRANSMISSION SIMULATOR"
700 PROCcrsr(0)
710 ENDPROC
720 DEF FNtype
730  PROCcts(1)
740 *FX21,0
750 =GET
760 DEFPROCcts(x)
770 PRINTTAB(15,3);CHR$(132+(1-x))
780 ENDPROC
790 DEF PROCsend(ch)
800 PROCcts(0)
810 PRINTTAB(6,11);
820 IF ch>31 AND ch<127 PRINTCHR$ch ELSE PRINTCHR$134
830 PRINTTAB(13,11)"    ":PRINTTAB(16-LEN(STR$(ch)),11);ch
840 PROCbinary
850 PROCRS432
860 PROCMODEM
870 PROCsound
880 ENDPROC
890 DEFPROCbinary
900 length= D%+S%+SGN(P%)+1
910 binary(0)=0
920 IF D%=7 ch= ch AND 127
930 total=0:FOR I%=1 TO D%
940   binary(I%)=ch MOD 2:ch=ch DIV 2
950   total=total+binary(D%-I%)
960   NEXT
970 binary(length-1)=1
980 IFS%=2 binary(length-2)=1
990 IF P%=0 PROCprintbin:ENDPROC
1000 binary(D%+1)=1
1010 IF P%=1 AND (total MOD 2)=1 binary(D%+1)=0
1020 IF P%=2 AND (total MOD 2)=0 binary(D%+1)=0
1030 PROCprintbin:ENDPROC
1040 DEF PROCprintbin
```

See 'Logging On', page 32

```
1050 PRINTTAB(24,11);STRING$(length," ")
1060 PRINTTAB(24,11);
1070 FOR I%= 0 TO length-1
1080   PRINT;binary(I%);
1090   NEXT:ENDPROC
1100 DEFPROCRS432
1110 PRINTTAB(5,19);STRING$(length," ")
1120 PRINTTAB(5,19);
1130 FOR I%= 0 TO length-1
1140   VDU128+binary(I%)
1150   NEXT:ENDPROC
1160 DEFPROCMODEM
1170 PRINTTAB(24,19);STRING$(length," ")
1180 PRINTTAB(24,19);
1190 FOR I%= 0 TO length-1
1200   VDU130+binary(I%)
1210   NEXT:ENDPROC
1220 DEFPROCsound
1230 FOR I%= 0 TO length-1
1240   SOUND1,-15,binary(I%)*48+156,0
1250   NEXT:ENDPROC
1260 DEFPROCcrsr(x):IFx=0 THEN VDU23;
     8202;0;0;0;:ELSE VDU23;29194;0;0;0;
1270 ENDPROC
1280 DEF PROCrect(x,y,l,w)
1290 MOVEx,y:DRAWx+l,y
1300 DRAWx+l,y+w
1310 DRAWx,y+w
1320 DRAWx,y
1330 ENDPROC
```

Program 2. Direct BBC to BBC comms.

```
10 REPEAT:IF(?&FE08 AND 1)=1 ch=?&FE09:
     VDUch:IF ch=13 PRINT
20 A$=INKEY$(0):IFA$<>"" ?&FE09=ASCA$:
     PRINTA$;:IFA$=CHR$13 PRINT
30 UNTIL0
```

Program 3. Pocket terminal program for most modems and phone comms.

```
 5 *FX8,3
 6 *FX7,3
10 REPEAT:IF(?&FE08 AND 1)=1 VDU(?&FE09 AND 127)
20 A$=INKEY$(0):IFA$<>"" ?&FE09=ASCA$
30 UNTIL0
```

AN INSPECTOR CALLED

INSPECT is a useful utility provided by Martin Clayden, which enables you to examine a Basic program held on disc without affecting one already in memory.

To use the program type in the source program as shown, run it then save the object code using:

*SAVE "VIEW" 8D0 9F0 8D0

Ensure that the program you wish to view is on the same disc and enter:

*INSPECT <fsp>

where fsp is the name of the file to be viewed. If the program cannot be found the message 'File not found' will be issued.

If the program is too large to fit in the available memory the message 'INSPECT space' will be displayed. 'Not Basic' will be output if the program is not a Basic program.

As the Beeb is placed into paged mode by the program the Shift key should be pressed to continue the listing.

Pressing Escape at any time will abort the listing.


```
 100 REM *** INSPECT V1.2 ***
 110 REM *** By M.Clayden ***
 120 REM *** Acorn User    ***
 130
 140 osfind=&FFCE:osargs=&FFDA:
     osfile=&FFDD
 150 oswrch=&FFEE:osnewl=&FFE7:
     osbyte=&FFF4
 160 page=&18:maxsize=&87:
     handle=&84:top=&13
 170 loadin=&8E:himem=7
 180 BRKV=&202:BASIC=&8A99:
     BREAK=&B433
 190 FOR PASS=0 TO 3 STEP 3
 200 P%=&08D0
 210 [OPT PASS
 220 LDX top
 230 INX
 240 STX loadin      \RECORD TOP
 250 LDX himem       \STORE
 260 DEX             \VALUE OF
 270 TXA             \LARGEST
 280 SEC             \LOADABLE
 290 SBC loadin      \PROGRAM
 300 STA maxsize     \FOR THIS MODE
 310 LDX #5
 320 LDA &700,X      \GET COMMAND
 330 CMP #&20        \SPACE ?
 340 BEQ ok1
 350 LDX #(SY-MSG)   \SYNTAX
 360 JMP out2
 370 .ok1
 380 INX
 390 LDA #&40        \OPEN FOR
 400 LDY #7          \READ
 410 JSR osfind      \ONLY
 420 STA handle
 430 BNE ok2
 440 LDX #(NF-MSG)   \NOT FOUND
 450 JMP out2
 460 .ok2
 470 TAY
 480 LDX #&70
 490 LDA #2
 500 JSR osargs
 510 LDA &71         \SIZE - HI
 520 CMP maxsize
 530 BCC ok3
 540 LDX #(VS-MSG)   \TOO LARGE
 550 JMP out1
 560 .ok3
 570 JSR close
 580 LDA #0          \CLEAR
 590 LDX #&12        \PARAMETER
 600 .cl             \SPACE
 610 STA &6F,X
 620 DEX
 630 BNE cl
 640 LDA #5          \POINT TO
 650 STA &70
 660 LDA #7          \FILE NAME
 670 STA &71
 680 LDA loadin
 690 STA &73
 700 LDX #&70        \POINT TO
 710 LDY #0          \PARAMETER
 720 LDA #&FF         BLOCK
 730 JSR osfile      \LOAD FILE
 740 LDY #0
 750 STY loadin-1
 760 LDA (&8D),Y
 770 CMP #&0D
 780 BEQ ok4         \CHECK THAT
 790 LDX #(NB-MSG)\IT IS BASIC
 800 JMP out1
 810 .ok4
 820 LDA #(newv
     MOD 256)
 830 STA BRKV        \REDIRECT
 840 LDA #(newv
     DIV 256)
 850 STA BRKV+1      \BREAK VECTOR
 860 LDA loadin
 870 STA page
 880 LDA #12
 890 JSR oswrch      \CLEAR SCREEN
 900 LDX #(V-MSG)
 910 JSR output
 920 LDA #14
 930 JSR oswrch      \PAGING ON
 940 LDA #138
 950 LDX #0
 960 .inbuf          \PUT LIST
 970 STX &80         \AND
 980 LDY RS,X        \?24=25
 990 BEQ out         \IN
1000 LDX #0          \KEYBOARD
1010 JSR &FFF4       \BUFFER
1020 LDX &80
1030 INX
1040 JMP inbuf
1050 .out
1060 RTS
1070 .output         \DISPLAY
1080 .char LDA       \MESSAGE
     MSG,X
1090 JSR oswrch      \ROUTINE
1100 INX
1110 CMP #&0D
1120 BNE char
1130 JSR osnewl
1140 RTS
1150 .close
1160 LDY handle
1170 LDA #0          \CLOSE THE
1180 JSR os          \FILE
1190 RTS             \AND END
1200 .out1
1210 JSR close
1220 .out2
1230 JSR output
1240 RTS
1250 .newv
1260 LDA #126     \ACKNOWLEDGE
1270 JSR osbyte \ESCAPE
1280 LDA #25
1290 STA page     \RESTORE PAGE
1300 JSR osnewl
1310 LDA #(BREAK
     MOD 256)
1320 STA BRKV     \RESTORE
1330 LDA #(BREAK
     DIV 256)
1340 STA BRKV+1 \BREAK VECTOR
1350 JMP BASIC
1360 RTS
1370 .MSG
1380 ]
1390 REM ADD TEXT TO END
     OF CODE
1400
1410 len=0:NB=FNTEXT
     ("Not BASIC")
1420 V=FNTEXT
     ("Inspecting")
1430 VS=FNTEXT
     ("INSPECT space")
1440 SY=FNTEXT
     ("Syntax: INSPECT <fsp>")
1450 NF=FNTEXT
     ("File not found")
1460 RS=FNTEXT
     ("L."+CHR$(13)+"?24=25"
     +CHR$(13)+CHR$(0))
1470 NEXT PASS
1480 END
1490 DEFFNTEXT(A$)
1500 L=len:len=len+LEN(A$)+1
1510 $(MSG+L)=A$
1520 =MSG+L
```

See pages 75-79

Program 1. Machine code program to auto-run a Basic program, by Phil Collet

```
>
   10 REMXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX
   20 VDU15
   30 *FX247,76
   40 *FX248,6
   50 A%=249 : Y%=0 : X%=PAGE DIV 256
   60 CALL &FFF4
   70 FOR I%=0 TO 3 STEP3
   80 P%=PAGE+6
   90 [OPT I%
  100 LDA #138
  110 LDX #0
  120 LDY #79
  130 JSR &FFF4
  140 LDY #76
  150 JSR &FFF4
  160 LDY #68
  170 JSR &FFF4
  180 LDY #14
  190 DEY
  200 JSR &FFF4
  210 LDY #82
  220 JSR &FFF4
  230 LDY #85
  240 JSR &FFF4
  250 LDY #78
  260 JSR &FFF4
  270 LDY #14
  280 DEY
  290 JSR &FFF4
  300 RTS : ]
  310 NEXT
```

Program 2.

```
10    DIM Z 47*47
20    FOR X% = 0 TO 46
30    T% = X%*47
40    FOR Y% = 0 TO 46
50    Z?(T%+Y%) = 0
60    NEXT Y%
70    NEXT X%
```

Program 3.

```
10    DIM Z 142
20    FOR I% = 0 TO 141
30    READ J%
40    Z?I% = J%
50    NEXT
60    DATA 1,1,2,7,12,8,...
```

Program 4.

```
10    DEF FNZ(X%,Y%)
20    LOCAL I%
30    I% = 0
40    REPEAT
50    IF (Z?(I%)=X%) AND (Z?(I%+1)=Y%) THEN = (I% DIV 2) + 1
60    I% = I% + 2
70    UNTIL I% > 140
80    =0
```

Program 5. New angles on screen lettering by Graham Walkden

```
>
    5 REM SUPERPRINT - GRAHAM WALKDEN
   10 MODE1
   20 COL%=3:M%=4:XMAG%=2:YMAG%=2:ANG%=0
   30 PROCPRINT("SUPERPRINT Demo",70,960
)
   40 COL%=1:XMAG%=1:YMAG%=2:ANG%=4
   50 PROCPRINT("Any Angle",820,600)
   60 XMAG%=1:YMAG%=1:ANG%=0
   70 PROCPRINT("NORMAL SIZED",100,750)
   80 COL%=3:ANG%=-2
   90 PROCPRINT("FOR BBC MICRO MODEL B",
100,550)
  100 COL%=3:ANG%=2:PROCPRINT("OR BBC A-
MODE 4",120,300)
  110 COL%=2:ANG%=0:XMAG%=1:YMAG%=2
  120 PROCPRINT("BY GRAHAM WALKDEN",110,
100)
  130 PROCPRINT(" ",0,0)
  200 END
  250 :
30010 DEF PROCPRINT (D$,X%,Y%)
30020 X1%=X%:Y2%=Y%:GCOL0,COL%
30030 PRINTTAB(0,30);D$;STRING$(39-LEND$
," ")
30040 FOR J=32 TO 64 STEP(M%/YMAG%):Y1%=
Y2%
30050  FOR I%=0 TO (LEND$*(M%*8))STEPM%
30060 IFPOINT(I%,J)<>0PLOT69,X1%,Y1%:PLO
T1,M%*XMAG%,0:X1%=X1%+M%*XMAG%+2 ELSEX1%
=X1%+M%*XMAG%+2
30070 Y1%=Y1%+ANG%
30080 NEXT
30090 X1%=X%:Y2%=Y2%+4
30100 NEXT
30110 ENDPROC
```

Program 6. Using an array parameter, by Allen Hardy

```
>
  10 REM
  20 N=5
  30 DIM TABLE$(N)
  40 FOR I=1 TO N
  50 READ TABLE$(I)
  60 NEXT I
  70 PRINT FNWORDIN("TABLE","WHICH DIRECTION",N)
 80END
 90 ====================
100 DEFFNWORDIN(ARRAY$,MESS$,N) LOCAL W,WORD$
120 REPEAT PRINTMESS$;:INPUT WORD$:W=0
130 REPEAT W=W+1
140 UNTIL WORD$=EVAL(ARRAY$+"$("+STR$W+")") OR W=N
150 UNTIL W<N
160 =W
170 ====================
180 DATA BACK, FORWARD, LEFT, RIGHT, ""
```

VII

See pages 75-79

VIII

Program 7. Multiple printing with Wordwise, by Jonathan Evans

```
>VDU1,27,1,69
>LIST
   10REM UTILITY TO PRINT MULTIPLE
   20REM COPIES FROM SPOOLED
   30REM WORDWISE FILES
   40REM BY JONATHAN EVANS
   50REM
   60REM FOR SERIAL PRINTER ENTER *FX
   70REM COMMANDS AS APPROPRIATE
   80DIM A% 20000
   90MODE7
  100REPEAT
  110CLS:INPUT''"Enter name of file to be
 printed"'"or type END ";N$
  120IF N$="END" THEN MODE7:END
  130INPUT'"How many copies do you requi
re ";N%
  140IF N%>10 PRINT'"Are you sure you wa
nt that many?":REPEAT:G$=GET$:UNTIL G$="
Y" OR G$="N":IF G$="N" GOTO 130
  150PRINT'"Ensure that you have the cor
rect disc"'"or tape in position and that
 printer"'"is switched on and at 'top of
 form'."'"Press SPACEBAR to start."
  160*FX15,1
  170REPEAT UNTIL GET=32
  180F=OPENIN(N$)
  190KOUNT=0
  200REPEAT
  210A%?KOUNT=BGET#F
  220KOUNT=KOUNT+1
  230UNTIL EOF#F
  240CLOSE#F
  250FOR I=1 TO N%
  260VDU2
  270FOR J=0 TO KOUNT
  280PRINT CHR$(A%?J);
  290NEXT J
  300VDU1,12
  310REM THE ABOVE SENDS PRINTER TO TOP
  320REM OF FORM BETWEEN PRINTING OF
  330REM EACH COPY. CHECK THAT CODE 12
  340REM IS CORRECT FOR YOUR PRINTER
  350NEXT I
  360VDU3
  370UNTIL FALSE
```

Program 8. Saving text for View, with each line formatted automatically, by Bernard Wilson

```
>LIST
   10 REM ********** VIEW3/7 **********
   20 REM ****     B.WILSON (C)      ****
   30 REM ******************************
   40 CLS
   50 REPEAT
   60 PRINTTAB(2,5);CHR$(141);CHR$(131);"VIEW Text File Transfer Utility"
   70 PRINTTAB(2,6);CHR$(141);CHR$(131);"VIEW Text File Transfer Utility"
   80 PRINTTAB(0,12);CHR$(141);CHR$(133);CHR$(136);"Edit & Format after loading
to VIEW"
   90 PRINTTAB(0,13);CHR$(141);CHR$(133);CHR$(136);"Edit & Format after loading
to VIEW"
  100 PRINTTAB(2,17);CHR$(131)"Press TAB to Terminate and SAVE"
  110 PRINTTAB(2,21);CHR$(131)"Select MODE 3 or MODE 7 ?...";:G$=GET$
  120 UNTIL G$="3" OR G$="7"
  130 mode=VAL(G$)
  140MODEmode:N%=HIMEM-LOMEM-124:*FX11,0
  150DIM B% N%:P%=B%:L%=0:@%=5:C%=&C00
  160 PROCbytesleft
  170 REPEAT
  180 G$=GET$
  190 PRINTG$;
  200 IF G$=CHR$&7F THEN P%=P%-2 ELSE $P%=G$
  210 IF G$=CHR$&D THEN PRINT
  220 P%=P%+1:N%=N%-1
  230 IF mode=3 AND POS=79 THEN PROCCR
  240 IF mode=7 AND POS=39 THEN PROCCR
  250 UNTIL G$=CHR$9 OR N%<255
  260 $(P%-1)=CHR$&D
  270PRINT"Name of text file to be written ";
  280INPUT $C%:IF $C%="" THEN $C%="TEXT" ELSE $C%=LEFT$($C%,6)
  290$C%="SAVE "+$C%+" "+STR$~B%+" "+STR$~P%
  300 PRINT'$C%':X%=0:Y%=&C:CALL &FFF7
  310MODE7:*FX12,0
  320END
  330 DEFPROCCR
  340 M%=P%
  350 REPEAT:M%=M%-1:VDU127:UNTIL ?M%=&20
  360 ?M%=&D
  370 vpos=VPOS
  380 PROCbytesleft
  390 PRINTTAB(0,vpos)
  400 PRINT$(M%+1);
  410 ENDPROC
  420 DEF PROCbytesleft
  430 PRINTTAB(0,1)N%" bytes remaining.                "
  440 ENDPROC
```

See 'The Beeb in Slow Time', page 81

Program 1. Setting up and demonstrating program for slow-speed operation of the BBC micro (enter it with PAGE = &2000)

```
  10 PROCassemble
  20 PROCinit
  30 REPEAT
  40   A$ = GET$
  50   A = ASC(A$)
  60   IF A = 0 VDU 0
  70   IF A>47 AND A<56 MODE A-48:A = 0
  80   IF A$ = "T" PROC_T_window:A = 0
  90   IF A$ = "G" PROC_G_window:A = 0
 100   IF A$ = "F" PROCfill:A = 0
 110   IF A$ = "W" PROCwait:A = 0
 120   IF A$ = "Z" MODE 6:PROCzero_page_map:
       A = 0
 130   IF A VDU A
 140   UNTIL0
 150 END
 160
 170    Interrupt Routines
 180 *************************
 190
 200 DEF PROCassemble
 210 IF ?&FE62 = 1 CALL Z%
 220 oldIRQ1V = !&204 AND &FFFF
 230
 240 FOR N% = 0TO2 STEP 2
 250   P% = &D00
 260
 270   [OPT N%
 280   NOP:NOP:NOP \  NMI Routine
 290   NOP:NOP     \  ***********
 300   NOP:NOP
 310   RTI
 320   ]
 330
 340   P% = &C00
 350   [OPT N%
 360                  .IRQ1V
 370                  \ *****
 380   BIT &FE60
 390   BVS pb7       \ PB6 pressed?
 400   LDA #0
 410   STA &FE60     \ Switch pulses ON
 420
 430   LDA #&FF
 440   STA &A80
 450   STA &A81
 460   STA &A82      \ Make a white marker
 470   STA &A83      \ visible on the bit map
 480   JMP oldIRQ1V
 490
 500   .pb7
 510   BMI no_key_pressed \ PB7 pressed?
 520   LDA #1
 530   STA &FE60     \ Switch pulses on
 540
 550   LDA #0
 560   STA &A80
 570   STA &A81
 580   STA &A82
 590   STA &A83      \ Remove white marker
 600
 610   .no_key_pressed
 620   JMP oldIRQ1V
 630
 640   .on           \ Change IRQ1 Vector
 650                 \ *****************
 660   SEI
 670   LDA #IRQ1V MOD 256
 680   STA &204
 690   LDA #IRQ1V DIV 256
 700   STA &205
 710   CLI
 720
 730                 \ initialise the VIA
 740                 \ *****************
 750
 760   LDA #1        \ Set PB0 as O/P
 770   STA &FE62     \ Data direction reg. B
 780   RTS
 790
 800   .off          \ Restore original IRQ1V
 810                 \ *********************
 820   SEI
 830   LDA #oldIRQ1V MOD 256
 840   STA &204
 850   LDA #oldIRQ1V DIV 256
 860   STA &205
 870   CLI
 880   RTS
 890   ]
 900
 910   NEXT
 920 ENDPROC
 930
 940 DEF PROCinit
 950 ON ERROR PROCerr_handle:END
 960 *FX12,2
 970           REM increase auto-repeat
               speed
 980 *FX16,0
 990           REM ADC interrupts off
1000 CALL on   :REM Enable
1010 Z% = off  :REM To allow IRQ to be
                switched
1020           :REM off before re-assembly
1030
1040 *KEY 10 PAGE = &2000|MOLD|M
1050
1060 CLS
1070 PRINT"Adjust speed of pulses."
1080 PRINT'"Press PB7 when ready."
1090 ?&FE60 = 0 :REM slow down
```

Continued ►

Program 3. Produces a display mimicking the effect when you run program 1 and clear the screen at slow speed. Press the space bar to start and stop the progress of the display

```
 10 MODE0
 20 VDU19;4;0;:REM If you like
    blue background
 30 FOR M%=1TO80*32-1
 40   PRINT"X";
 50   NEXT
 60 FOR M%=0 TO 255
 70   FOR N%=&3000 TO &7F00 STEP 256
 80     N%?M%=0
 90     IF INKEY(0)>0 REPEAT
        UNTIL INKEY(0)>0
100     NEXT
110   NEXT
```

See 'The Beeb in Slow Time', page 81

◄ Continued

```
1100 REPEAT
1110   PRINT"I";
1120   UNTIL (?&FE60 AND 1) = 1
1130 REM i.e. PB7 was pressed and IRQ
1140 REM routine has set PB0 to logic 1
1150
1160 CLS
1170 PRINT"Ready"
1180 ENDPROC
1190
1200 DEF PROC_T_window
1210 VDU28,10,25,70,10
1220 ENDPROC
1230
1240 DEF PROC_G_window
1250 VDU24,100;200;1100;900
1260 ENDPROC
1270
1280 DEF PROCfill
1290 D$ = GET$
1300 IF D$ = "A" PROCalphabet:ENDPROC
1310 FOR N% = 0TO2556
1320   IF D$ = "R" VDU(32+RND(95)) ELSE PRINT D$;
1330   NEXT
1340 ENDPROC
1350
1360 DEF PROCwait
1370 REPEAT
1380   UNTIL(?&FE60 AND 1) = 0
1390 ENDPROC
1400
1410 DEF PROCzero_page_map
1420 VDU19;4;0;
1430 VDU23;12;0;0;0;
1440 ?&34E = 0
1450 VDU12,28,0,24,39,14,12
1460 ?&E00 = 13:?&E01 = 255
1470 FOR I% = &E02 TO &1000:?I% = 0:NEXT
1480 ENDPROC
1490
1500 DEF PROCalphabet
1510 FOR N% = 1TO100
1520   PRINT"ABCDEFGHIJKLMNOPQRSTUVWXYZ";
1530   NEXT
1540 ENDPROC
1550
1560 DEF PROCerr_handle
1570 ?&FE60 = 1
1580 REPORT
1590 PRINT" at line ";ERL
1600 ENDPROC
```

See 'Triple Test', page 155

Listing 1.

Acorn

```
 10 REM *IEEE488 with string data output
 20 M=&4000                         :REM Set pointer to base address of array
 30 progend%=?&71*&100+?&70 :REM Calculate data array end address
 35 *IEEE                           :REM Call IEEE file
 40 cmd%=OPENIN("COMMAND")  :REM Open command channel
 50 data%=OPENIN("DATA")     :REM Open data channel
 60 PRINT#cmd%,"BBC DEVICE NO",1 :REM Set device address of BBC computer
 70 PRINT#cmd%,"CLEAR"       :REM Intilialise interface
 80 printer%=OPENIN("4")     :REM Set printer device address
 90 PRINT#cmd%,"LISTEN",printer%,"EXECUTE" :REM Set printer to listen
100 REPEAT
110 M$=$M                          :REM Get data string from memory
120 PRINT#data%,M$                :REM Output data string
130 M=M+LEN(M$)+1                 :REM Update pointer
140 UNTIL M>=progend%             :REM Until end of data array
150 CLOSE#printer%                 :REM close printer channel
160 CLOSE#data%                    :REM Close data channel
170 CLOSE#cmd%                     :REM Close command channel
```

Listing 2.

Acorn

```
 10 REM *IEEE488 with binary data output
 20 M=&4000                         :REM Set pointer to base address of data array
 30 progend%=?&71*&100+?&70 :REM Calculate end address of data array
 40 *IEEE                           :REM Call IEEE file
 50 cmd%=OPENIN("COMMAND")  :REM Open command channel
 60 data%=OPENIN("DATA")     :REM Open data channel
 70 PRINT#cmd%,"BBC DEVICE NO",1 :REM Set device address of BBC computer
 80 PRINT#cmd%,"CLEAR"       :REM Intialise interface
 90 printer%=OPENIN("4")     :REM Open printer channel
100 PRINT#cmd%,"LISTEN",printer%,"EXECUTE"    :REM Set printer to listen
110 PRINT#cmd%,"WRITE BINARY",PROGEND%-&4000 :REM Set binary output
                                                  and number of bytes
130 REPEAT
140 BPUT#data%,?M                  :REM Output data byte
150 M=M+1                          :REM Update pointer
160 UNTIL M=progend%              :REM Until end of data array
170 CLOSE#printer%                 :REM Close printer channel
180 CLOSE#data%                    :REM Close data channel
190 CLOSE#cmd%                     :REM Close command channel
```

Listing 3.

Cambridge Computer Consultants

```
10 REM Cambridge Computer Consultants IEEE488 data string output
20 M=&4000                          :REM Set base address of data block
30 progend%=?&71*&100+?&70  :REM Calculate end address of data array
40 printer%=4:sec_add%=-1     :REM Set device primary & secondary addresse
50 PROCIEINIT(&FC20)            :REM Initialise the interface
60 PROCIEWRIT(printer%,sec_add%) :REM Open printer channel
70 PROCIEPUTA(M, progend%-M):REM Output data array from memory
80 PROCIECLR                    :REM Close channel, good housekeeping!
```

See 'Triple Test', page 155

Listing 4.

Cambridge Computer Consultants

```
10 REM Cambridge Computer Consultants IEEE488 data byte output
20 M=&4000                       :REM Set base address of data block
30 progend%=?&71*&100+?&70       :REM Calculate end address of data array
40 printer%=4:sec_add%=-1        :REM Set device primary & secondary addresses
50 PROCIEINIT(&FC20)             :REM Initialise the interface
60 PROCIEWRIT(printer%,sec_add%) :REM Open printer channel
70 REPEAT
80 PROCIEPUTB(?M)                :REM Output data byte
90 M=M+1                         :REM Update pointer
100 UNTIL M=progend%             :REM Until end of data
110 PROCIECLR                    :REM Close channel, good housekeeping!
```

Listing 5.

C.S.T. – Procyon

```
10 REM IEEE488 C.S.T. - Procyon data string output
20 M=&4000                       :REM Set pointer to base address of data array
30 progend%=?&71*&100+?&70       :REM Calculate end address of data array
40 *IEEE                         :REM Call IEEE file
50 REPEAT
60 M$=$M                         :REM Get data string from memory
70 PRINT#4,M$                    :REM Output data string
80 M=M+LEN(M$)+1                 :REM Update pointer
90 UNTIL M>=progend%             :REM Until end of data array
```

Listing 6.

C.S.T. – Procyon

```
10 REM IEEE488 C.S.T. - Procyon data byte output
20 M=&4000                       :REM Set pointer to base address of data array
30 progend%=?&71*&100+?&70       :REM Calculate end address of data array
40 *IEEE                         :REM Call IEEE file
50 printer%=OPENOUT"4"           :REM Open printer channel
60 REPEAT
70 BPUT#printer%,?M              :REM Output data byte
80 M=M+1                         :REM update pointer
90 UNTIL M=progend%              :REM Until end of data array
```



See 'Pixels on Paper' and 'A Dump in its True Colours', pages 163-167


```
10 REM *** C/EPAT ***
20 REM Hybrid program to dump all graphics MODEs in actual colour
30 REM on any printer with the ESCape L n1 n2 graphics facility
40 REM including EPSONS, STARS, CANONS, SHINWA, INFORUNNER etc
50 REM G.B.Hill September 1983
60 REM PROGRAM START
70 S%=&A00
80 ?&80=00:?&81=&0A: REM point to pattern
90 PROCcheck
100 IF NOT graphics THEN PRINT"Not a graphics MODE. Can't dump.":VDU7:END
110 PROCassemble
120 REM enable printer, and set linefeed (send ESC A 8)
130 VDU2,1,27,1,65,1,8
140 REM clear paper
150 VDU1,10,1,10,1,10
160 FOR X%=0 TO 1279 STEP 16
170 REM send bit code (ESC L 0 3 - 768 dots per line)
180 VDU1,27,1,76,1,0,1,3
190 FOR Y%=0 TO 1023 STEP 4
200 !Xlo=X%+Y%*&10000
210 CALL three_bytes
220 NEXT
230 VDU1,10
240 NEXT
250 REM reset linefeed and disable printer
260 VDU1,27,1,65,1,12,1,12,3
270 END
280
290 DEFPROCcheck
300 DIM user 3
310 A%=&87
320 !user=USR(&FFF4)
330 mode=user?2
340 IF mode>5 OR mode=3
    THEN graphics=FALSE ELSE graphics=TRUE
350 ENDPROC
360
370 DEFPROCassemble
380 osword=&FFF1
390 oswrch=&FFEE
400 pattern=S%
410 !pattern=&04010200
420 pattern!4=&07050306
430 pattern!8=&03020000
440 pattern!12=&07050501
450 S%=S%+16
460 Xlo=S%
470 Xhi=S%+1
480 Ylo=S%+2
490 Yhi=S%+3
500 logicol=S%+4
510 value=S%+5
520 byte=S%+9
530 count_8=S%+12
540 mode=S%+13
550 S%=S%+14
560 FOR opt=0 TO 2 STEP 2
570 P%=S%
580 [OPT opt
590 \SUBROUTINES
600 \to calculate POINT(X,Y)
610 .point          ldx #Xlo MOD 256
620                 ldy #Xlo DIV 256
630                 lda #9
640                 jsr osword
650                 ldx #logicol MOD 256
660                 ldy #logicol DIV 256
670                 lda #&B
680                 jsr osword
690                 rts
700  \subroutine to print three prepared bytes
710 .print_bytes    ldx #2
720 .loop           lda #1
730                 jsr oswrch
740                 lda byte,X
750                 jsr oswrch
760                 dex
770                 bpl loop
780                 rts
790 \increment X by 2
800 .inc_X2         clc
810                 lda Xlo
820                 adc #2
830                 sta Xlo
840                 lda Xhi
850                 adc #0
860                 sta Xhi
870                 rts
880 \to calculate three bytes & print them
890 .three_bytes    lda #8
900                 sta count_8
910 .byte_loop      jsr point
920                 lda value
930                 and #7
940                 tay
950                 lda (&80),Y
960                 ror A
970                 rol byte
980                 ror A
990                 rol byte+1
1000                ror A
1010                rol byte+2
1020                lda user+2
1030                eor #0
1040                beq mode0
1050                lda &80
1060                eor #8
1070                sta &80
1080 .mode0         jsr inc_X2
1090                dec count_8
1100                bne byte_loop
1110                jsr print_bytes
1120                rts
1130 ]
1140 NEXT
1150 IF P%<>&A89 THEN PRINT''"You must have made an
     error in the assembly language routine.
     "'"Please check it.":VDU7:END
1160 ENDPROC
```

Listing 3. A 'universal' pattern dump for all graphics modes.

See 'Pixels on Paper' and 'A Dump in its True Colours', pages 163-167

Listing 4. Assembly language dump for Canon PJ1080A.

```
 10 REM MACCAN4
 20 REM Copyright G.B.Hill
 30 REM March 1984
 40 REM Version 4
 50 REM Prints all graphics modes using physical colour
 60 REM Assembly language printer dump for CANON PJ1080A printer
 70 REM with all slow subroutines removed
 80
 90 MODE7
100 REM Operating system addresses
110 oswrch=&FFEE
120 osasci=&FFE3
130 osword=&FFF1
140 osbyte=&FFF4
150 osargs=&FFDA
160 oscli=&FFF7
170 DIM user 3,cli 30
180 REM Locate program
190 PROCfiling_system
200 IF tape THEN base=&D00
210 IF disc THEN base=&A00
220 IF NOT (tape OR disc) THEN PRINT"Can't *SAVE, unrecognised filing system.":VDU7:END
230 S%=base
240 REM reserve space for jump
250 S%=S%+3
260 REM Set up constants and variables
270 REM Xlo,Xhi bytes of X coord: Ylo,Yhi bytes of Y coord
280 Xlo=S%:Xhi=S%+1:Ylo=S%+2:Yhi=S%+3
290 !Xlo=&03FF0000
300 REM logicol is the byte where osbyte deposits the logical colour
310 logicol=S%+4
320 REM value is the byte where osbyte deposits the physical colour
330 value=S%+5
340 S%=S%+9
350 REM Store starting coordinates for subroutine setzero
360 XYstore=S%
370 !XYstore=!Xlo
380 S%=S%+4
390 message=S%
400 $message="Only modes 1,2,4 and 5"+CHR$13+CHR$(7)
410 S%=S%+24
420 control=S%
430 $control=CHR$27+"r"+CHR$1+CHR$80
440 S%=S%+4
450 REM pass and cnt8 are counters, store is a byte to pass to the printer.
460 cnt8=S%
470 pass=S%+1
480 store=S%+2
490 !cnt8=&00000108
500 S%=S%+4
510 FOR PASS=0 TO 2 STEP 2
520  P%=S%
530 [
540 OPT PASS
550 \
560 \SUBROUTINES
570 \
580 \Reset X and Y to screen top left
590 \
600 .setzero        ldx #3
610 .pling          lda XYstore,X
620                 sta Xlo,X
630                 dex
640                 bpl pling
650                 rts
660 \
670 \Check current mode, if not graphics,
     issue error message and set carry flag.
```

Listing 5. How long does a screenful take?

```
 10 REM Printer Benchmark
 20 REM Time taken to print 25
    rows of 80 characters
 30 VDU2,1,7,1,13
 40 FOR I=1 TO 25
 50 FOR J=1 TO 40
 60 VDU1,42,1,120
 70 NEXT
 80 VDU1,13
 90 NEXT
100 VDU1,7,1,13,3
```

See 'Pixels on Paper' and 'A Dump in its True Colours', pages 163-167

```
680 \
690 .modecheck      lda #&87
700                 jsr osbyte
710                 tya
720                 cmp #6
730                 bpl wrongmode
740                 cmp #3
750                 beq wrongmode
760 .rightmode      clc
770                 rts
780 .wrongmode      ldy #00
790 .msg            lda message,Y
800                 jsr osasci
810                 iny
820                 cpy #24
830                 bne msg
840                 sec
850                 rts
860 \
870 \ MAIN PROGRAM
880 \
890 .canon          jsr modecheck
900                 bcc start
910                 rts
                          \end if not graphics
920 .start          jsr setzero
930                 lda #2
940                 jsr oswrch
950 .scan           ldy #0
960 .ctrl           lda #01
970                 jsr oswrch
980                 lda control,Y
990                 jsr oswrch
1000                iny
1010                cpy #4
1020                bne ctrl
1030 .line          ldx #Xlo MOD 256
              \osword to get physical colour
1040                ldy #Xlo DIV 256
1050                lda #&09
1060                jsr osword
1070                ldx #logicol MOD 256
1080                ldy #logicol DIV 256
1090                lda #&B
1100                jsr osword
1110 .onebit        lda value
            \select the colour to be printed
1120                ldx pass
      \red on pass 1, green on 2, blue on 3
1130 .rgb           dex
1140                beq this_colour
1150                ror A
1160                jmp rgb
1170 .this_colour   ror A
1180                rol store
1190 \
1200 .incX2         clc
1210                lda Xlo
1220                adc #02
1230                sta Xlo
1240                lda Xhi
1250                adc #0
1260                sta Xhi
1270 \
1280                dec cnt8
1290                bne line
1300 \
1310 .printchar     lda #01
1320                jsr oswrch
1330                lda store
1340                jsr oswrch
1350 \
1360                lda #8
1370                sta cnt8
1380 \
1390 .eol           lda Xhi
1400                cmp #05
1410                bne line
1420 .resetXhi      lda #0
1430                sta Xhi
1440 \
1450                inc pass
1460                lda pass
1470                cmp #4
1480                bne line
1490 \
1500                lda #1
1510                sta pass
1520 \
1530 .eop           sec
1540                lda Ylo
1550                sbc #04
1560                sta Ylo
1570                lda Yhi
1580                sbc #0
1590                sta Yhi
1600                lda Yhi
1610                cmp #&FF
     \Yhi goes negative at end of page
1620                beq finished
1630                jmp scan
1640 .finished      lda #3
1650                jsr oswrch
1660                rts
1670 ]
1680 NEXT
1690 IF P%<>base+256 THEN PRINT''"You must
     have made an error in typing in the
     code. Please check and try again.
     ":VDU7:END
1700 REM set up jump
1710 base?0=&4C
1720 base?1=canon MOD 256
1730 base?2=canon DIV 256
1740
1750 COM$="SAVE ""CANONPJ"""+STR$~base+"
     +100 "+STR$~base
1760 PROCoscli(COM$)
1770 PRINT'"SAVING DUMP"''"*";COM$
1780 END
1790
1800 DEFPROCfiling_system
1810 X%=&80
1820 Y%=0
1830 A%=0
1840 !user=USRosargs
1850 tape=(?user=1 OR ?user=2)
1860 disc=(?user=4)
1870 ENDPROC
1880
1890 DEFPROCoscli($cli)
1900 X%=cli MOD 256:Y%=cli DIV 256
1910 CALLoscli
1920 ENDPROC
```

LISTINGS TO LISTEN TO

WE had a noisy postbag after our challenge to readers to invent simple routines that produced entertaining sound effects. Sadly, more than half of the programs didn't work! Here are our five winners, though, each of which earns a crispy blue note, as promised.

Two of them put a Sheene on their programming technique with a motorbike effect. Dunstable reader Robin Smith's program sets up a linear speedo on the screen to keep pace with the acceleration and deceleration, while Paul Riley's version kicks-starts and then works up through the gears. For the best effect, turn your computer chair around and straddle it.

Worcester must be one of the farthest points in England from the sea, which could be why S J Bates of that town sends a program so evocative of a holiday idyll. Pour yourself a Bacardi, close your eyes, and listen to the pounding surf . . .

From the sublime to the ridiculous with E R Osborne of Lowestoft's cheeky *Wolf Whistle*. And finally *The Tree* from Crispin Turville-Petre – mysteriously titled but mesmerising.

Any more?



```
10REM** MOTORBIKE **
20REM** by Paul Riley **
30ENVELOPE1,1,3,0,0,7,7,0,126,0,0,
  -126,90,100
40FOR I=1 TO 3
50SOUNDO,1,63,12
60SOUNDO,0,0,5
70NEXT
80SOUNDO,-15,3,255
90A=INKEY(200)
100FOR G=1 TO 4
110READ S,F
120FOR J=S TO F
130SOUND 1,0,J,0
140A=INKEY(5)
150NEXT
160A=INKEY(40)
170NEXT
180A=INKEY(100)
190S=185
200FOR I=-15 TO 0 STEP .03
210S=S-.1
220SOUND1,0,S,0
230SOUND&10,I,3,100
240NEXT
250DATA 40,160,100,170,100,180,110,185
```

```
10REM ** MOTORBIKE **
20REM ** by R. Smith **
30MODE1
40VDU 19.3.2.0.0.0
50ENVELOPE 1,15,-20,-20,-20,4,4,4,126,0,
  0,0,126,126
60SOUND 0,1,255,1
70PRINTTAB(0,4)"SPEED=:     MPH"
80PRINTTAB(0,6)"0 10 20 30 40 50 60 70 80
  90 100"
90 VDU4:PRINTTAB(10,10)"PRESS ANY KEY"
100*FX21,0
110IF GET
120PRINTTAB(10,10)"             "
130FOR X=8 TO 250
140SOUND 1,0,X,1
150IF X>100 SOUND 0,1,7,1 ELSE SOUND 0,1.7,2
160PROCSPEED(3)
170NEXT
180FOR X=250 TO 7 STEP -1
190SOUND 1,0,X,1
200IF X<100 THEN SOUND 0,1,7;2 ELSE SOUND 0,
  1,7,1
210PROCSPEED(0)
220NEXT
230 GOTO 90
240DEFPROCSPEED(C)
250VDU 5
260GCOL0,C
270IF X*4>400 AND C=3 THEN GCOL0,2
280IF X*4>850 AND C=3 THEN GCOL0,1
290MOVE X*5-32,860:PRINT"="
300ENDPROC
```

```
10REM WOLF WHISTLE
20REM E.R. OSBORNE
30ENVELOPE 1,0,3,0,0,21,0,0,127,127,0,
  -127,126,126
40SOUND 1,1,140,5
50SOUND 1,0,0,6
60ENVELOPE 1,0,3,-2,-2,18,18,18,127,127,
  0,-127,126,126
70SOUND 1,1,140,10
```

```
10CLS
20REM**The Tree**
30REM** by Crispin Turville-Petre**
40REM** piano and organ music **
50ENVELOPE 1,12,-12,-36,-45,90,255,255,
  127,-40,0,0,126,0
60ENVELOPE 2,11,-26,-36,-45,255,255,
  255,127,0,0,0,126,0
70SOUND 1,1,1,1:SOUND 2,1,1,1
```

```
10REM Sea-side by S.J. Bates
20ENVELOPE1,6,0,0,0,6,3,4,11,-2,0,-2,
  126,75
30ENVELOPE2,4,0,-3,-2,3,3,21,50,-1,-12,
  -2,126,126
40REPEAT
50wave=RND(3)
60SOUNDO,1,wave+3,20
70length=RND(20)+40
80SOUND&1000,0,0,length
90IF RND(2)=2 PROCcry
100UNTIL FALSE
110END
120DEFPROCcry
130num=RND(3)
140FORgull=1TOnum
150SOUND1,2,230,20
160IF num>1 SOUND2,2,215,25
170IF num>2 SOUND3,2,240,10
180NEXT
190ENDPROC
```

Paul Beverley's second probing into the inner workings of the BBC micro

THE BEEB IN SLOW TIME

SLOW TIME

LAST month we looked at what the BBC micro is doing internally by using the 'bit-map' technique. This displays the lower part of the computer's memory on the screen, but many things happen so quickly that it is difficult to see what is going on – hardly surprising as the 6502 processor can execute up to a million instructions per second! A way is needed of slowing the whole thing down to the sort of speed a human being can appreciate. The most obvious way would be to slow down the system clock. Unfortunately, this is not possible because many functions of the computer depend on the internal clock, not least of which are the video system and the RAM.

Another technique is to generate a rapid succession of interrupts and spend so long servicing them that there is hardly any time left to do any normal processing. This is done by feeding a square wave into the NMI (non-maskable interrupt) input of the 6502 processor. Since we don't actually want to do anything in response to these interrupts, the service routine consists of a simple delay created by using a number of NOP (no operation) instructions.

The actual timings used in my prototype were as follows: interrupts were generated roughly every 15 microseconds (µs), the interrupt service routine takes 7µs (seven NOP instructions), the time the system takes to respond to an NMI is 3.5µs, and then to execute the RTI takes another 3µs. Thus there are only about 1.5µs out of every 15 left for the processor to do its own processing. The actual timings can be adjusted by changing the number of NOPs and by altering the frequency of the square wave with a variable control.

A mere 1.5µs processing out of every 15 suggests the system should work at about one-tenth normal speed, but in fact it is much slower because the normal IRQ interrupts on which it depends are still coming at the same rate as before and still take the same number of cycles to be serviced. This then takes up a much higher proportion of the available processing time. (In program 1 on yellow pages ix and x, I have suggested that the ADC interrupts be switched off to reduce the number of IRQs and hence the likelihood of a system crash.)

'A way is needed of slowing the whole thing down to the speed a human can appreciate'

You may wonder what happens when an instruction is being executed which needs more than three cycles of processor time (1.5µs). When an NMI occurs, the processor always finishes off the instruction it is executing before starting the service routine, so, if a six-cycle instruction is being executed, by the time the processor has finished it and dealt with the NMI, there is zero time before the next NMI occurs, in which case it cannot do another instruction until the end of the succeeding NMI routine. If the NMIs come too rapidly, the system cannot cope and the stack becomes corrupted, rendering the machine inoperable. The only way out then is to press the break key. The hardware is arranged so the pulse generator is disabled when break is pressed because it is when the PB0 line is low that the generator is enabled; but when the VIA is reset, PB0 becomes an input and hence the pull-up resistor has the effect of making the external circuit register a logic 1, ie fast speed.

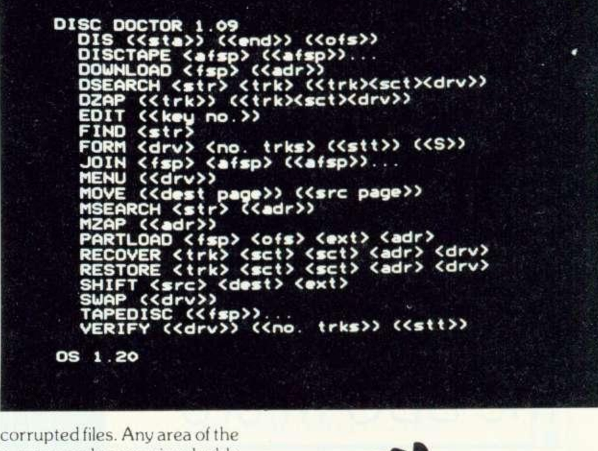
Figure 1 overleaf shows the simple circuit used. It consists of two chips – a 7413 Schmitt trigger circuit which produces the square wave pulses, and a

Computer Concepts

ROM SOFTWARE
for the BBC Micro

Disc Doctor

£33.35 incl.



DISC DOCTOR is a general purpose utility ROM which adds 20 new commands to the BBC Micro. Most of these are concerned with disc operation although some of the commands are general purpose.

The extensive range of disc commands include a disc search routine and a very easy to use sector editor which allows any sector to be examined and changed if necessary. The built-in formatting command has a special option allowing dual catalogues on each side of the disc, so that up to 60 files per side may be used - almost twice the normal limit.

⋆RECOVER and ⋆RESTORE commands are provided to help in the restoration of deleted or partially corrupted files. Any area of the disc may be transferred to memory, altered and ⋆SAVEd or ⋆RESTOREd back onto the disc. These commands prove invaluable when hours or even days of work are accidentally lost.

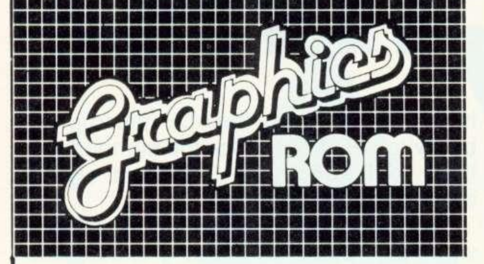
Many disc users often encounter the frustration of programs originally designed for use on cassette and require relocating to operate on disc. Disc Doctor provides commands to help with the transfer. ⋆TAPEDISC and ⋆DISCTAPE provide a simple means for automatically transferring non-protected files between tape and disc. Once programs are on disc, there are several relocation functions available. ⋆MOVE will move a program from one page in memory to any other. ⋆DOWNLOAD will load the program from disc and automatically move it to a specified position. ⋆MENU is more comprehensive still, offering a menu of programs available and allowing single key-press selection of any one. The chosen program is then loaded, re-located if necessary and automatically executed, whether BASIC or machine code.

General purpose commands include: ⋆DIS - which will disassemble an area of memory, following or skipping jumps, adding an offset, disassembling an instruction at a time or disassembling continuously.
⋆MSEARCH - to quickly locate any string of bytes in memory, specified either as a character string, numeric values of a mixture of both.
⋆MZAP - a very easy to use memory editor, allowing the user to scroll quickly up/down memory. It can be called from other programs to examine memory, then return to the program.
⋆EDIT - will list any or all of the function key definitions, so that the user may edit and copy them.

The DISC DOCTOR ROM contains a full help menu listing all the commands and their syntax for quick reference. A spiral-bound manual gives general information about discs and describes each of the commands in detail, with examples. Easy-to-follow fitting instructions are supplied, allowing the ROM to be easily fitted by even the inexperienced user.

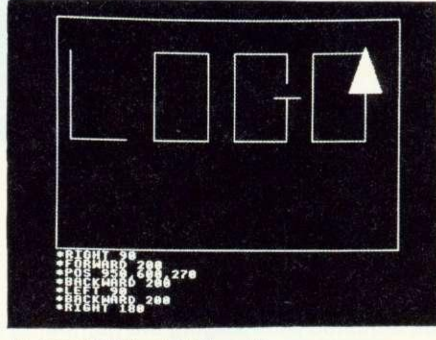
Easy to Fit



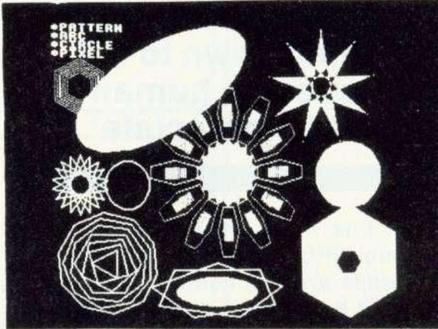


The GRAPHICS EXTENSION ROM brings 30 new powerful graphics commands to the BBC machine. The commands may be typed immediately or included within programs written in BASIC, BCPL, FORTH, etc. The commands act quickly (being machine code) and are always available without taking large amounts of program memory. The commands can be split into three catagories:

1. Sprite Graphics
A sprite is similar to a user-defined character, except that sprites may be multi-coloured, several times larger (8x8 to 24x24 pixels in size), they are easily defined and altered with in-built commands and may be saved and later loaded. Sprites may be displayed and quickly moved around. Up to 32 different sprites may exist at the same time. 'Films' may also be created, in which any sprite is treated as a single 'frame'. Each time the 'film' is used the next 'frame' in sequence is automatically displayed, allowing simple animation of sprites. Any number of the possible 32 sprite numbers can be defined instead as a 'film' which may include a list of up to 47 'frames' in any order.



2. LOGO 'Turtle' Graphics
By using simple FORWARD, BACKWARD, LEFT and RIGHT commands a 'turtle' can be moved very quickly around the screen, producing intricate patterns by the most user-friendly means. The commands may be included in structured BBC BASIC programs providing a system faster and more powerful than many of the packages currently used to demonstrate LOGO turtle graphics.



3. General purpose commands
- ⋆ FILL will fill an intricate shape.
- ⋆ CIRCLE provides fast and easy circle drawing.
- ⋆ ARC fast easy arc drawing.
- ⋆ PLOT provides 3D graphics drawing by plotting with X, Y, and Z co-ordinates.
- ⋆ SCALE allows a scaling factor to be applied to everything subsequently plotted.
- ⋆ ROTATE applies a rotation upon all subsequent standard PLOT, DRAW and MOVE commands so that they are rotated around any origin.

A built-in help menu showing the syntax of all commands is provided for quick reference. Included in the package is a comprehensive spiral-bound manual and step-by-step fitting instructions, suitable even for the inexperienced.

Further details available upon request.



£33.35 incl.







16 Wayside, Chipperfield, Hertfordshire. WD4 9JJ Telephone: Kings Langley (09277) 69727

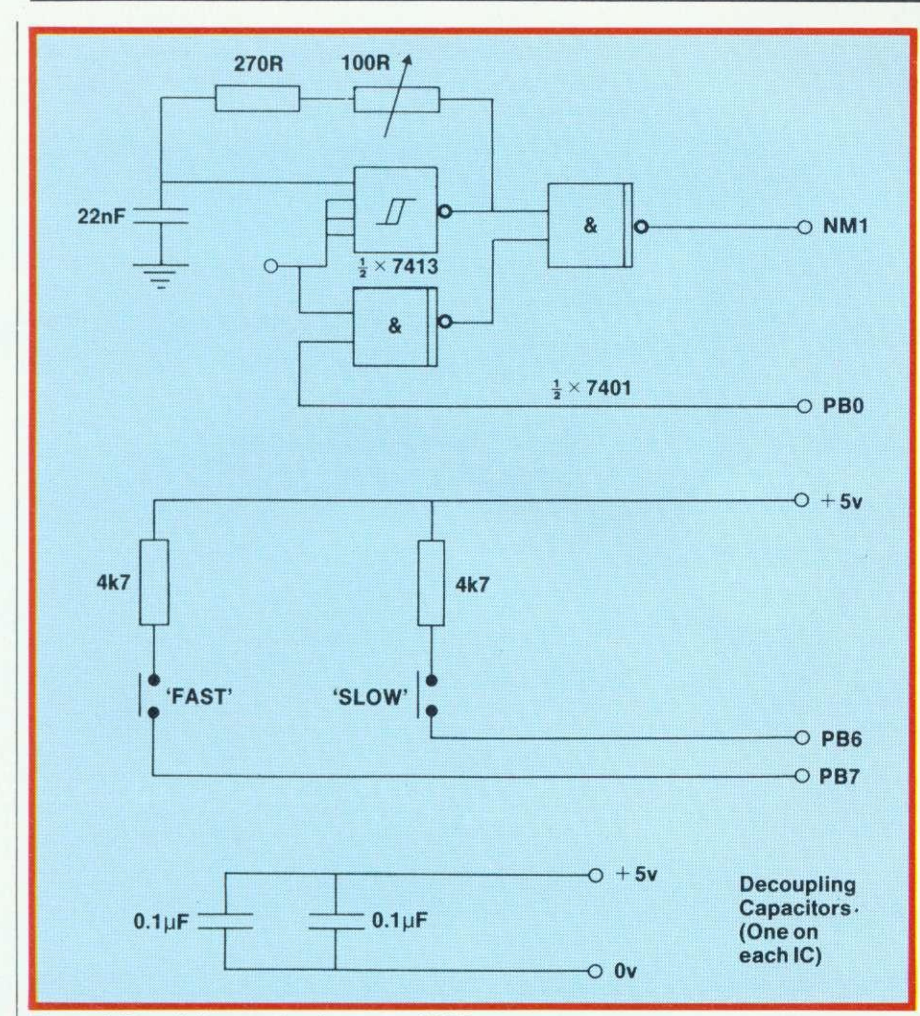


Figure 1. Circuit diagram for slow-speed BBC

7401 open collector NAND gate to enable you to switch the pulses on and off using one of the lines of the User Port (PB0). If you do not need the NMIs for anything else such as discs or Econet, you could make it even simpler by not bothering to use the open collector circuit and just driving the NMI line directly from the 7413. This works, but is not 'good practice', because you should only use open collector devices on the NMI line.

The circuit has to be connected to the micro through the user port. Unfortunately, although this provides almost all the lines needed, including the +5 volts supply, it does not give access to the NMI line. The only connectors on which this is available are the 1MHz bus and the disc interface, both of which use 34-way, IDC connectors. A 34-way connector and cable is expensive for just one line, so I suggest you solder a wire directly onto a component on the PCB (shock, horror!). You could solder to pin 3 or pin 8 of IC27 or direct to pin 6 of the 6502A. However, rather than solder directly to the leg of a chip, you can solder to the north end (ie nearest the back of the computer) of R81, the 3k3 pull-up resistor on the NMI line. This is situated along the west side of the 6502A. Unfortunately on earlier machines (up to and including issue 3) R81 is mounted vertically. Thus, if the resistor body is over the north hole, it makes it more difficult to get at something solderable. With a fine soldering iron, though, it should not prove impossible, and with issues 4 and 7 PCBs it is simplicity itself as the resistor is horizontally mounted.

One problem is that on some of the earlier machines there was a mistake on the printed circuit boards in the area of the NMI connection to the disc controller chip. This means that if you have an issue 1, 2 or 3 PCB and you are not already using disc or Econet, you would be well advised to check the voltage on the NMI line first. If it is less than 0.5 volts (ie logic 0) then you have problems and the safest way is to consult a dealer. One thing you could check though is that links S2 (Econet) and S9 (disc) are made with tinned copper wire and if they are not, then they should be fitted.

The only other hardware we are using is PB6 and PB7 for inputs to allow us to signal the system to switch from slow to fast and vice versa. This is done because when the system is being fully stretched by the NMI interrupts, it often does not respond to the keyboard. Also, since we are using an IRQ routine to scan PB6 and PB7, the monitoring program does not need to be running to enable the user to switch speeds. Therefore, demonstrations can either be done using the main program or by typing in from the keyboard.

The program listing to run our little circuit consists of two main parts. The first contains the machine code routines for both the NMI and the IRQ interrupts. The NMI routine is a simple delay using NOPs, while the IRQ routine checks whether PB6 is grounded and, if so, switches to slow speed and, if PB7 is grounded, switches back to fast.

The second part is the Basic demonstration routines. These allow you to set up various test situations by single key presses. As you play with this system you will find other things to demonstrate and add to the program, but as it stands, the software sets up the following keys:

0-7: To switch between the different modes you can use the number keys, 0 to 7.

F: Pressing this key allows you to fill up the screen with characters. The key pressed after the F is the character used for filling the screen, except that pressing R produces a set of random characters, and A produces sets of the alphabetic characters.

W: This is a 'wait' function. It allows you to enter other keystrokes, but does not act on them until PB6 is pressed. In fact, it waits until the IRQ routine has responded to the pressing of PB6 and has set PB0 low. When you press PB6, the system switches to slow speed and the keyboard no longer responds, but the characters previously entered are already in the keyboard buffer and will therefore be acted on by the system at the slow speed.

Z: This key puts the micro into mode 6 and displays the bit map we discussed last month. However, doing so wipes out the program! Therefore you must enter or load the program at &2000 by setting PAGE= &2000 first. You should notice in this mode that as you switch from fast to slow a white marker appears and disappears in the middle of the screen.

T and **G** are used to define a text and graphics window respectively.

Here are a few other suggestions. The letters in quotation marks are the key-

page 87 ▶



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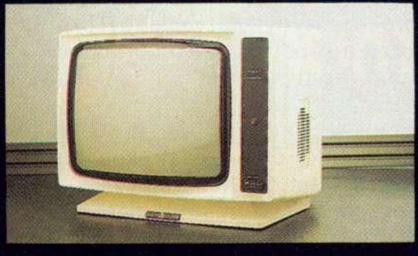
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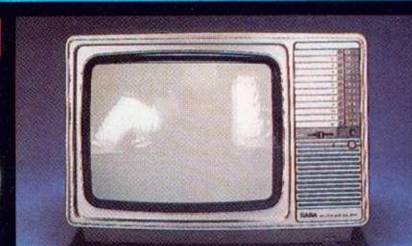
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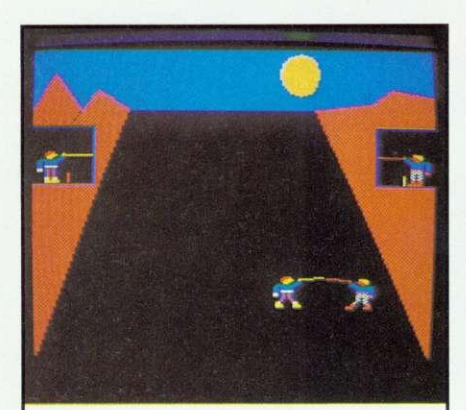
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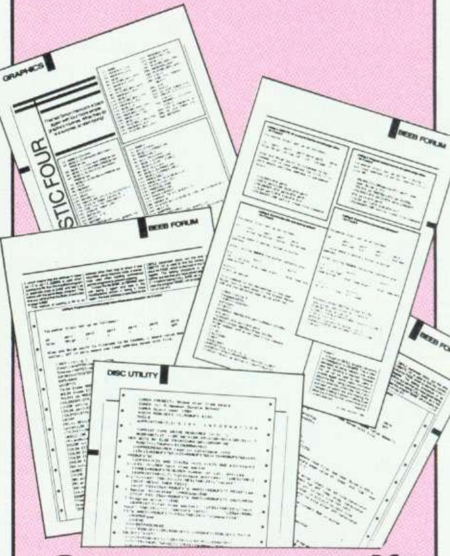
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TURN TO PULL-OUT CARD PAGES 177/178



◄ page 83

strokes needed to achieve the particular effect, and statements like 'CTRL – L' mean you hold the CTRL key down and press L. This produces a control code which, in the case of CTRL – L is 12 which clears the screen. After each combination of keystrokes, press PB6 to initiate action on those commands typed in after the W.

'0 F X W CTRL – L': Go into mode 0, fill the screen with Xs and then clear the screen. The screen is cleared neither from top to bottom nor from bottom to top, but by clearing the first byte of each page of memory, followed by the second byte of each page and so on. If you try CTRL – P instead of CTRL – L, ie do a CLG, you will see that it clears from the top down and, by comparison, takes a very long time. If you get tired of waiting, press PB7 and go back to full speed.

'0 F R W 7 0': Having filled the mode 0 screen with random rubbish you can, in slow time, watch it being cleared as mode 7 is selected. As it goes back to mode 0 it produces a very strange display in the interim, the screen splitting into four sections. This is presumably due to the processor re-programming part of the 6845 CRT controller, then working something else out, then finishing off the re-programming. The only explanation I have is that it may get held up as it tries to alter the C0 and C1 lines which changes the 'hardware wraparound' for the hardware scrolling. The internal VIA operates at 1MHz rather than 2MHz and therefore may be even more tied up by the excess NMIs. But that is only a theory.

If you want to see what is meant by 'hardware scrolling', go into mode 0, press escape and list the program. When the listing reaches the bottom of the page and is about to start scrolling, press PB6. You will see that each time the screen scrolls, the top line appears momentarily at the bottom, is wiped out and then overwritten by the new line of text. If you try this again with a text window defined from within the program either by using T or by going into the zero-page bit map by using Z, you will see software scrolling. Starting from the top of the screen, each line is copied on top of the one above, the bottom line is wiped out and then the new line is written in. This is a laborious process and hardware scrolling does save a lot of processor time.

There are many things that can be done by using control codes. Page 507 of the *User Guide* will show you what they all are, but for example you could draw a filled triangle as shown in program 2.

Even if your machine uses disc or Econet, you will still be able to use these interfaces in the normal way as long as the pulses are switched off. The circuit is designed so that when switched to fast speed, the NMI line is available for normal use by other devices. It does not matter that you have over-written the NMI routines in PAGE &D00 since as soon as a disc function is called for, these routines are re-written into RAM by the disc filing system (I presume the same is true of Econet though I have not tried it).

A word of warning. It is possible to simplify the pulse circuit even more if you are prepared to disconnect the circuit manually before using the disc system. However, in the development stages I was doing just that, but on one occasion forgot to disconnect the pulses while trying to save the program onto disc. The result was a disc that was so badly corrupted that not only was I unable to read track and sector using *Disc Doctor*, but what is more, when I had given up the idea of rescuing the other programs on the disc, I could not even get it to re-format without generating errors! In the end I had to wipe the whole disc with a tape-head de-magnetiser. That did the trick – I was then able to format it again.

This technique can also reveal an obscure design fault in the 6502 microprocessor. Apparently, if an NMI happens to arrive just as the processor is finishing off an IRQ service routine (during the last cycle of the RTI, I believe) it does not finish off the instruction properly, thereby corrupting the stack. The chances of this ever happening during normal operation of a 6502-based system is literally several millions to one against. However, because we are stretching the system to its limits, we should not be surprised if it hangs up on us occasionally. The remedy is simply to press BREAK, which is programmed to restore things.

If in using this method, you do discover anything of interest, or anything you do not understand, write to the Editor and let us know. We may be able to find an answer, and in any case it is interesting to have some feedback to let us know that people are actually using our project ideas.

Next Month we turn our attention to the random number generator that is contained within the Basic ROM. How does it work? How good is it? Can it be used from machine code programs? We will also be looking at a piece of simple hardware to go on the user port that will provide a high-speed supply of random numbers.

```
ctrl-P          (Clear the screen)

ctrl-Y          (= PLOT)

ctrl-@          (= PLOT 0 i.e. MOVE)

[or use ctrl-E (PLOT 5 i.e. DRAW)]

ctrl-@, ctrl-B (X co-ordinate = 512 = &20)

ctrl-@, ctrl-C (Y co-ordinate = 768 = &30)

ctrl-Y, U       (Draw a triangle = PLOT 85)

ctrl-@, ctrl-D (= 1280 = &40)

ctrl-@, ctrl-@ (=    0 = &00)
```

Program 2. Manual program for drawing a filled triangle

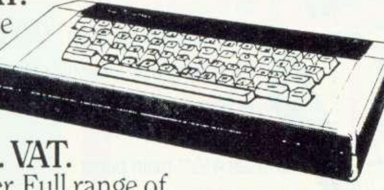
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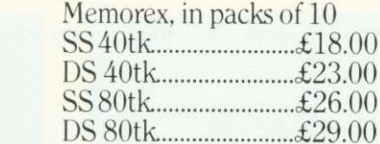
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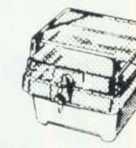
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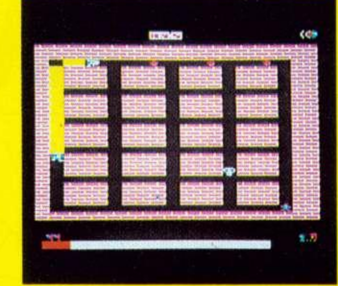
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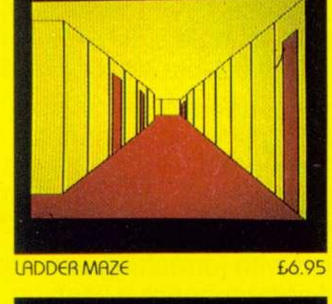


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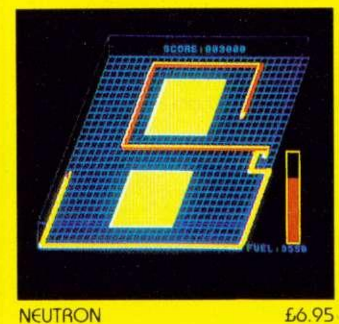
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MY BLUE HEAVENS

Peter Vasey brightens up the background

Here is a neat method for changing the background colour of the screen when running protected software. A frequent problem with commercial programs is that protection techniques prevent the user from changing features such as sound effects and colour. This short routine shows how the difficulties can be overcome.

Type in the program and save it onto disc or cassette without running it. Once you have done so press Break and then type MODE 5. Notice that the background colour of the screen has changed to blue.

To understand how it works, look at the listing once again. Line 110 sets the VDU vector at &20E,20F to point to the new routine. Line 130 then waits until the VDU drivers are sent the MODE 5 command. When this happens the machine-code equivalent of VDU 19,0,4,0,0,0 is executed (lines 150 to 180) and the VDU vector is then returned to its normal state (line 190). Lines 250 to 270 are included to allow disc users to auto-start programs with SHIFT/BREAK.

If you prefer another colour to blue, simply change the '4' in line 170 to the appropriate colour code.

This technique was originally designed for *Aviator* but it can be applied to most software and with a little modification more complex effects can also be achieved.

```
   10 REM ******************************
   20 REM BLUE HEAVENS! by Peter Vasey
   30 REM ******************************
   40 REM DISC/CASSETTE
   50 REM Press BREAK to activate
   60 REM for cassette version
   70
   80 FORN%=0TO3STEP3
   90 P%=&A00
  100 [OPTN%
  110 LDA#&B:STA&20E:LDA#&A:STA&20F
  120 RTS
  130 CMP#5:BNEnotyet
  140 JSR&E0A4
  150 LDA#19:JSR&FFEE
  160 LDA#0:JSR&FFEE
  170 LDA#4:JSR&FFEE
  180 LDA#0:JSR&FFEE:JSR&FFEE:JSR&FFEE
  190 LDA#&A4:STA&20E:LDA#&E0:STA&20F
  200 LDA#247:LDX#0:JSR&FFF4
  210 LDA#0
  220 .notyet JMP&E0A4
  230 ]
  240 NEXT
  250 *FX247,76
  260 *FX248,0
  270 *FX249,10
```



ACORN USER'S

ANNIVERSARY COMPETITION

THIS issue marks the second anniversary of the launch of *Acorn User*. To celebrate the event here is a special birthday quiz open to everyone to enter. It's designed to test your general knowledge of computing and computers, and almost all the answers to the questions have appeared in the pages of the magazine within the last two years. We're giving away no less than 20 first prizes of five packs of software (three for the BBC micro and two for the Electron), worth about £40. Ten runners-up will receive an *Acorn User* sweatshirt. See panel below for details.

1 What is the meaning of Basic?
a) Just a nice name for a language designed to introduce newcomers to computers.
b) Beginners' All-purpose Symbolic Instruction Code.
c) Beginners American Standard Interface Code.

2 Was the first home computer in the UK to be sold at under £100:
a) the ZX80?
b) the ZX81?
c) the Acorn Atom?



3 On a BBC micro how many elements are there in an array created by the Basic statement DIM A$(20,2)?
a) 40
b) 42
c) 63

4 On a BBC micro, is a bit:
a) half a byte?
b) a binary digit?
c) one of the pins on a silicon chip?

5 Did the first issue of *Acorn User* appear in:
a) January 1982?
b) July 1982?
c) November 1982?

6 Was the original name of the BBC micro:
a) Quark?
b) Proton?
c) Neutron?



7 How much RAM does the BBC model A have?
a) 8k
b) 16k
c) 24k

8 A colour monitor:
a) checks that the high-resolution graphics on a computer are working?
b) gives a better picture than the average TV set?
c) enables you to use your computer to switch between different TV channels?



HOW TO ENTER

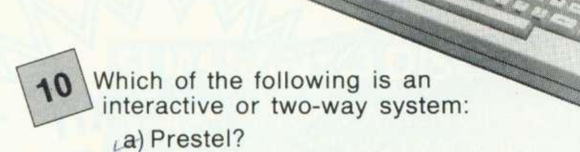
Select your answers from the categories a, b and c in each question (for example 1a, 2c, 3b, etc), complete the 'tiebreaker' sentence and send your entry on a postcard to July Competition, Acorn User, 68 Long Acre, London WC2E 9JH to arrive not later than Friday, August 3, 1984.

PRIZES

Each first prize will be made up of the top five packages listed in this month's software chart (see page 145): 'Snooker' (Visions) and 'Hopper' (Acornsoft) for the Electron, and 'Twin Kingdom Valley' (Bug-Byte), 'White Knight II' (BBCSoft) and '747 Flight Simulator' (Dr Soft) for the BBC micro. Ten runner-up prizes of an Acorn User sweatshirt will be awarded.

We regret that no correspondence or negotiation can be entered into regarding the competition or prizes – only postcard entries will be accepted.

9 Which screen mode in BBC Basic does the Electron not work in?
a) mode 0
b) mode 2
c) mode 7



10 Which of the following is an interactive or two-way system:
a) Prestel?
b) Ceefax?
c) Oracle?

11 *Snapper*, *Rocket Raid* and *JCB Digger* are all games written by Jonathan Griffiths. Who are the publishers?
a) BBC Publications
b) Acornsoft
c) Micropower



12 A modem is:
a) a device which enables a computer to communicate with another computer down a phone line?
b) a computer which runs full CP/M?
c) a computer which acts as a terminal to drive another computer?

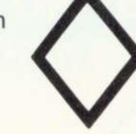
13 ASCII means:
a) the second, upgraded version of the American Standards for Computers recommendations?
b) American Standard Code for Information Interchange?
c) a coding system based on the name of its inventor?

14 Sargon is:
a) an adventure game?
b) a chess program?
c) an interface?

15 In hex, B392 is the decimal equivalent of:
a) 45,970?
b) 43,298?
c) 46,026?

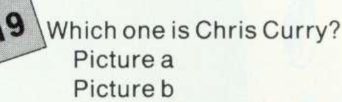
16 Charles Babbage's 'Analytical Engine' is:
a) a 19th-century forerunner of the computer?
b) an early computer developed at Manchester University around 1946?
c) A device which allows you to tune a car by means of a BBC micro?

17 In a standard flowchart for a program what does this sign (right) mean?
a) the beginning or end of the program
b) an input or output operation
c) a decision-making operation



18 Information Technology Year was:
a) 1981?
b) 1982?
c) 1983?

19 Which one is Chris Curry?
Picture a
Picture b
Picture c


a


b


c



20 Complete in not more than 20 words the following sentence:
I like *Acorn User* because . . .

MARCH/APRIL COMPETITION WINNERS

HERE are the answers to the March and April competitions. Both involved putting up with the appalling Mad Alex – well, we all have to sometimes . . .

In the **March** competition it was apparent to most of you that Alex had talked the most demented drivel. Those of you who weren't driven around the bend worked out that, yes, the kitty does work and the highest value the coin could have would be 700 addisons and the lowest 27 addisons.

In the second part, the occupations of the four newly elected committee members were as follows:

Anthony – Graphics consultant
Bartholomew – Machine-code programmer
Christopher – Designer
David – Hardware expert

The winners, who each receive £20 worth of Acornsoft software, were M English of High Wycombe, Bucks; D Moore of Birkenhead; and F M Cameron of Hereford.

In the **April** comp the amount Alex owes you after your sojourn through the dungeon is 19,700 gold pieces (19,712 if you include your entry money). About half of you got this right.

The winners were Andy Cowan of Birmingham, David Westbrook of Oxford, and S Jhawar of Stockton-on-Tees. They have been sent £20 worth of Acornsoft software.

Those of you who continue to send in lengthy descriptions of Mad Alex's genetic make-up do so at your peril: rumour has it that he has perfected a technique of electrocuting his least favourite people over the telephone line. You have been warned . . .

As usual, the best entry came from Frank Dashwood of Edinburgh, whose scribbles were composed on the back of an enormous poster advertising a wine called Bull's Blood – Mad Alex's favourite tipple!

For wit and humour beyond the call of duty we're awarding a special prize to Mr Dashwood – a fiver to buy himself a bottle of the red stuff.

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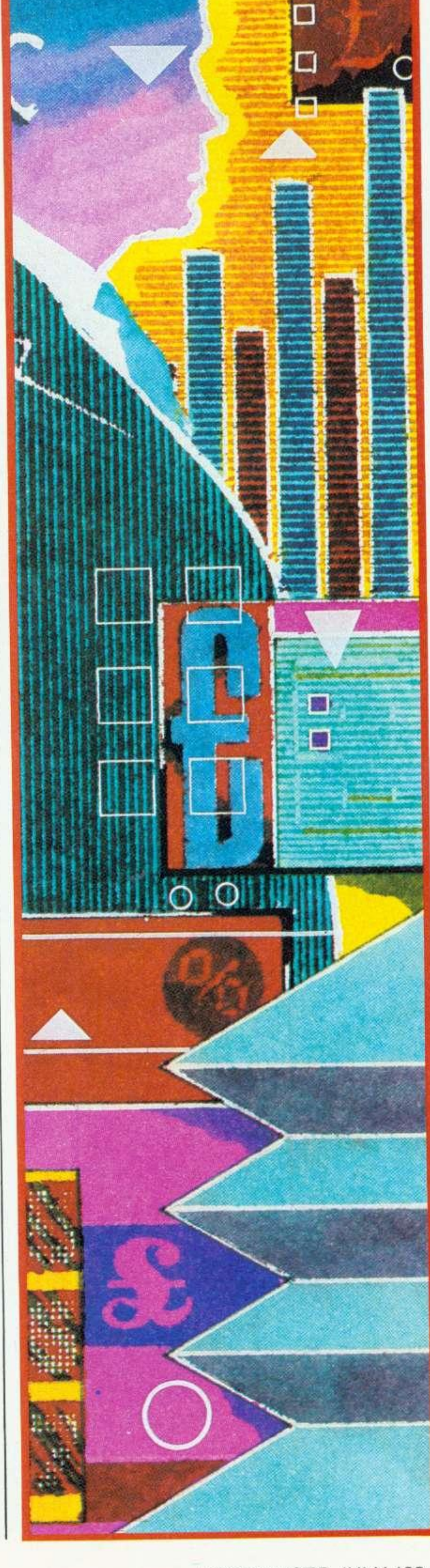
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THE MONEY PROGRAM I

John Vaux picks the Accountant out of the Z80 second processor bundle and renders this account



THE Z80 second processor is a unit which connects to the BBC microcomputer via the Tube interface. The hardware and software was summarised last month, and this and subsequent reviews will concentrate on the software 'bundled' with the second processor. Bundled software is a new trend whereby programs are provided apparently free with an item of hardware. Nothing is really free of course, but if you add up the total normal price of the software it can come to a surprisingly high figure. If you have a use for the majority of it then it is well worth having.

Acorn's Z80 second processor comes with the packages listed in figure 1 overleaf, and the total value of all this lot if bought separately at retail prices would be over four times the price of the second processor!

The software comes on a total of seven discs, all fully documented in a set of matching manuals of very good quality. A special program called *Prepare* is provided to help you produce working copies of whichever programs you wish to use. This program is fully menu-driven with good prompts at all stages telling you what to do. If you generate all the software you finish up with 12 working discs. This program was quite impressive and augured well for the professional quality of the rest of the package.

ACCOUNTANT

This month we look at the book-keeping program called *Accountant*, written by Compact Software International, which is well-proven on other Z80 business computers. It is a simple system based on sales and purchase daybooks and a nominal ledger, from which a range of management reports can be obtained. Extra software can be bought to expand it at a later date to a full integrated accounts suite with sales ledger, purchase ledger and stock control.

The package lives on three discs: a start-of-day disc, main program disc and data disc. It runs on twin disc drives (2 x 400k), although if you have small data files it would be possible to run it on one drive. The system is started by inserting the start-of-day disc in drive A and keying in START. All this does is ask for today's date and then tell you to load the program disc in A and your data disc in B. The sequence seems a bit strange and got a bit annoying after a while. One could have expected this to be incorporated on the program disc, thereby saving a disc change.

Nominal ledger set up

The first thing to do in any accounts package is set up a set of nominal codes in a logical manner to ensure the ability to produce meaningful management reports. This can be quite a problem for the beginner and it is therefore a pleasant surprise to find that *Accountant* has a sample set of codes already set up, which can be modified as required for your particular business. A full description of this excellent idea and an explanation of the code structure provided is in the manual. In fact, a full set of files is provided so you can dive straight into trying out the system. When you have finished getting to know the system these may be regenerated from the original discs using the *Prepare* pro-

gram or a blank set may be generated using an option in *Accountant*. If you try to do anything without having created any data files it soon tells you!

Certain nominal ledger control accounts must be present for the system to run. The codes for these must be entered on a control file which also contains your company details (name, address, etc.) and VAT codes and rates and your period end, year end and VAT dates. Facilities are also provided for entering budgets against nominal codes and also group codes for further analysis.

Journal entries

Direct posting to the nominal ledger for such things as opening balances, petty cash, adjustments, etc, is done in batches using the 'journal entries' option. The batch technique enables easy checking that all entries have been made by reconciliation of a manually-calculated batch total with one generated by the computer. It also gives a better audit trail for checking by auditors or VAT men. A printed copy is always produced for any posting.

Taking the 'journal posting' option on the screen menu display brings up another screen for entry of the details. Entered dates are always checked for validity, and a check that entered nominal codes are on the file is made at time of entry. Amount entries are only allowed through if they are numeric.

At this point a slight criticism must be made. If you have made an entry and wish to change it, only the newly-entered characters are taken, even though the old ones are still displayed. For instance in a description, say the original entry was WWIDGETS and it should have been WIDGETS: when you key in the correction the field will show as WIDGETSS but will enter correctly. This is even more confusing in amount fields. Say you had entered 1000 and it should be 100. Values are moved to the right of the field by the system, so it will show as several blanks followed by 1000.00. When you enter your correction it will show as 1001000.00 – which it will correctly pick up. If you blank out the 1000.00 the system will reject the entry because it objects to blanks in numeric fields. It would be better if the field was cleared when you start entering new data, as it is in some cases when re-entering an invalid nominal code.

Daybook entries

The 'purchase daybook' option handles purchase invoices, credit notes, cash purchases, and so on. Again, all input is batched giving a check that all documents have been entered.

Defaults for dates, description and nominal code can be entered which will be offered as the value for each line and can then be changed if required. Net amount, VAT amount and gross amount must all be entered, although VAT is not calculated. Each item may be split across additional nominal codes if required. At the end of the batch the totals are checked. If they disagree you have the option to either correct the batch total, step through the items looking for the error, or abandoning the batch.

On acceptance the audit trail is printed and then the nominal ledger is updated with the details.

'Sales daybook' entries are made in a manner almost identical to those for the purchase daybook. One difference noticed is in the cash sales option. Here the system can be made to calculate the net amount from the gross by omitting the entry of a net amount.

Reports

Several types of report can be generated, including:

- Account enquiry to show details of any nominal account and transactions.
- Trial balance with or without period balances.
- Transaction listing showing full details of all transactions for every nominal code.
- Budget/variance report showing performance against budget for current period and year-to-date. The variance is shown as pounds difference and also as a percentage difference.
- Formatted trial balance based on group codes.

THE Z80 BUNDLE

- **CP/M operating system with the GSX graphics extension.** This is the standard operating system for eight-bit business micros and should give access to the enormous range of programs already available for that system provided they are made available on BBC format discs.
- **Z80 version of BBC Basic.**
- **Professional Basic** Similar to Basics from Microsoft and Digital Research.
- **CIS Cobol** Popular language for writing business software.
- **FilePlan** Card-index type system for storing data for rapid indexed retrieval.
- **GraphPlan** Financial modelling program or spreadsheet.
- **MemoPlan** Word processor.
- **Accountant** Book-keeping program.
- **Nucleus** Program generator.

Figure 1. Bundled software

After all reports for a month have been done, the month end routine must be run. This clears all individual transactions and carries the balance into the next month. At year end further balancing is performed and specified accounts set to zero.

CONCLUSIONS

The whole program has been specially adapted for the BBC micro, and seven of the BBC's function keys are used. Luckily f9 is not included as this is adjacent to the break key – and inadvertently hitting that drops you out of the program and back to Z80 Basic. A book of function key strips is provided, one for each piece of bundled software.

The system is rather slow in operation. Loading a new program module in on changing a menu option takes from 10 to 30 seconds. Even passing from the heading level to item entry level on the screen takes about 30 seconds. Updating of the data files also is rather slow, typically about 20 seconds per item in a batch: as there can be up to 200 items per batch this could take a very long time. The conclusion is to keep batches small, say up to about 20 items.

Apart from deliberately hitting the break key, it was not found possible to 'crash' the system in normal operation. Ridiculous input such as wrong dates or enormous amounts were trapped with an appropriate message.

The documentation appears excellent on initial perusal. However, having read it from cover to cover it does not appear to be in the best logical order. The beginner will find himself hopping about from one chapter to another, and possibly not getting back to where he was.

The layout of the printed reports is very good. The main heading of each report is in wide print to make it stand out and pages are properly numbered with totals appearing where appropriate.

To place the above criticisms in perspective, this software is well up in the league of better accounts packages for microcomputers. It is obviously intended for the smaller business with not too many documents to be input as it is not one of the fastest systems for data input. Having got the data in, the enquiry and reporting facilities are fast and give very good information.

To summarise then, *Accountant* is well-written, well-documented and proven. If the rest of the software provided with the second processor is as good (and I know some of it is) then the total package is excellent value for money.

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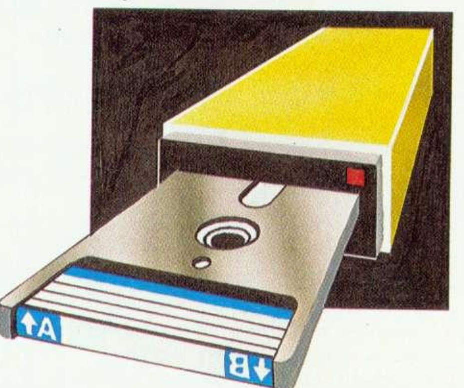
disc... tamen nedue enim haec mo
discus ictum nedue.
uis nostrud exertitation,
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TERMINOLOGY GUIDE

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MANAGEMENT BY MENU

Ian Rowlings test runs StarBase

'StarBase', GCC (Cambridge) Ltd, £69 (plus P&P)

STARBASE is a ROM/disc-based data management system that is a truly professional tool. It is supplied with a 16k ROM, fitted in the usual manner, and a 40/80 track disc containing applications and extension software (51k). It is essentially menu-driven and makes extensive use of the function keys to provide the necessary functions. The manual is also comprehensive and explains not only how to use the system but also how it works.

Each file created can contain up to 4096 records. A record may consist of up to 69 fields, each of which can hold up to 255 characters of alphanumeric data. The maximum record size is 920 characters. The database capacity, that is to say the maximum file size, depends on the disc system used – a double-sided, 80-track drive will allow a file of 396k, almost full capacity; a single-sided, 40-track drive obviously allows proportionally less.

When you have formatted a disc to hold your database you are ready to start. Once you've mastered the structure of the system, its menus and function keys, it is easy to use. Calling *STARBASE provides the initial menu:

C CREATE
F FILE
Q QUIT

Pressing 'C' provides the 'CREATE' menu:

<f0> Initialise disc
<f1> Build input form
<f2> Review disc
<f3> Re-date disc
<f4> Re-name disc

<f0> should not be confused with physical disc initialisation; it initialises the system and creates a file in the form you require. At this stage you are prompted for the user name, date and disc configuration, etc. You can also enter a password for security purposes. It can take a while to initialise and a useful tip is to *BACKUP the disc after initialisation so that, without having to repeat the procedure, you have blanks available for future use.

<f1> provides a subsidiary level 2 menu which is used to design the record structure. Once construction is complete the file structure can't be modified. Other calls from this menu allow review of the file structure and certain minor modifications.

The second, level 2 menu accessed from the main menu is the 'FILE' menu:

<f0> INSERT
<f1> AMEND
<f2> DELETE
<f3> BROWSE
<f4> SORT
<f5> SHORT FORM
<f6> SELECT SUBSET
<f7> SAVE SUBSET
<f8> LOAD SUBSET

This is used for manipulating data once the file has been created. Each of these calls in turn provides, where appropriate and controlled by the function keys, the additional facilities that, once mastered, make the data management easy. All the normal functions you would expect of a professional system are provided, including useful additions to make the work quicker and easier. For example, calling <f5> allows you to select and thus restrict the fields on which the other functions are to work. It is surprising, given that you have a lot of work to do in particular fields, how much time this can save.

<f6> works in a similar manner, allowing you to restrict the work carried out on a subset of records of your choice, and provides the following Create Subset menu:

<f0> Finished
<f1> All records in file
<f2> No records (Clear)
<f3> Record by Keysearch
<f4> Add to subset from file
<f5> Select from Subset

When you select any of these you are prompted to enter the value or value and test condition by which the subset is to be defined. A wildcard facility allows selection of any specific value in any field. Such subsets may be manipulated with the other functions, including saving onto another disc. Sorting (descending or ascending) uses the Shell-Metzner method, which is very fast, and it can be based on the contents of up to five fields.

In addition to the facilities dealt with so far, there are other utilities and applications software on disc. Booting this provides the following menu:

A SBU01 Recover deleted record
B SBU02 Increment field
C SBU03 Field statistics
D SBU04 Configure printer
E SBU05 Print file review
F SBU06 Print record cards
G SBU07 Build print format
H SBU08 Print address labels
I SBU09 Print format

Option B allows you to increment or decrement the value of a particular field. The destination field need not be the same as the source field, and it can be used in conjunction with either numeric or alphabetic fields.

C allows you to calculate a total and average value of a specified field in a defined subset.

Booting the disc provides default settings for an Epson-type dot matrix printer. Calling D prompts for input concerning print formatting, enabling a variety of paper sizes and printer types to be used.

Utility E automatically prints most of the relevant statistical information relating to a file. F does as it says, also printing the field titles.

G is used before and in conjunction with H and I. It dictates the layout and contents of address labels, forms, letters and the like. The menu is:

1 Save form
2 Load form
3 New form
4 Edit form
5 List format
6 Print format

Selecting 3 provides yet another range of function keys to enable formatting, printer configuration and so on.

Utility H uses the predefined print format and allows you to arrange it in such a way as to suit a variety of labels – eg, which fields are to be printed and in what order.

I is similar to H, allowing formatting of invoices and forms.

The disc contains 21 further utilities which may be used at will and incorporated into your own programs. They provide useful functions relating to the manipulation of data and files, extracting and inputting data and statistical information and many more. Useful examples are included.

Because the system is menu driven and makes extensive use of the function keys it is flexible and easy to use. StarBase is adequately protected with suitable error messages. It is an exceptionally good package, and I believe it would compare favourably with similar products.

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Most serious users of micro computers require the facility to display in 80 columns, especially for word processing. Try this on most monitors and the result will be a frustratingly fuzzy image.

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PRIVATE VIEW

Geoff Nairn turns the pages of the Edfax teletext emulator

'Edfax', Tecmedia, BBC model B with disk drive, £30 (£20 to schools)

THE WORD teletext conjures up images of desperately looking under the sofa for the handset, or ploughing through interminable menu pages just to find out what's on television that evening. Add to this the delay between pages and the limited nature of the information stored on them, and the broadcast teletext services come out as very much the poor relation to public viewdata services such as Prestel. However, Prestel is expensive to use, and many organisations are now setting up their own private viewdata systems.

Edfax is a software package that lets you set up just such a system on a single BBC micro, with the pages of information stored on disc. Strictly speaking, it's a teletext emulator rather than a viewdata system; the difference is in the method of going from one page to another – more about this later. The name 'teletext', however, is reserved for broadcast services such as Oracle or Ceefax, so to avoid confusion *Edfax* will here be described as a private viewdata system.

The package was developed by Tecmedia in conjunction with the Microelectronics Education Programme primarily for the schools market, though it is available to others – albeit at a higher price. This means that the software has been tested at several schools before publication and that the manual accompanying the software covers educational objectives and possible applications, as well as being an easy-to-follow operating guide.

The software consists of two separate programs: the editor, which can create or edit pages of viewdata; and the display program, which, as its name suggests, is used to display the pages. The display program can be legally copied onto as many discs as you want, along with any pages.

Also on the disc is a database of 80 pages that demonstrates some of the possibilities of the system. This is divided into three main sections, the first showing the use of the various viewdata 'attributes' – coloured text, double-height characters, etc – to create eye-catching pages. The second section demonstrates two possible applications of a viewdata system: a small database of possible career choices for children, and an 'electronic' school magazine. The third section is possibly the most interesting, containing 15 picture pages, all designed by schoolchildren and of a standard comparable to that of commercial 'information providers'.

The display program is simplicity itself to use: pressing SHIFT and BREAK automatically runs the program and displays page 100. In most teletext systems page 100 is reserved for the main menu, from which you select further sub-menus until you reach the desired page. The page numbers are keyed in as three-digit numbers that appear in the top left-hand corner of the screen, and after a couple of seconds the requested page appears on the screen. If the page number does not exist a message to that effect flashes up and the program does not attempt to find the page on disc. A directory of valid pages must be held in memory.

Unlike proper viewdata systems, *Edfax* does not support page routing; to go from page 200 to page 201, for example, you have to key in the full page number '201'. With a viewdata system you might need to press only '1'. As some of the pages on Prestel can have up to 10-digit page numbers, page routing can save a lot of typing, but with only 80 pages on the *Edfax* system, the simpler teletext method of page access is quite adequate.

One of the best features of the display program is the 'cycle' facility, by which pages can be automatically displayed one after the other, in a similar fashion to a carousel slide projector. The delay between each page on the 'carousel' is preset at about 10 seconds, and to break the cycle you press the space-bar. This feature could be used for shop window displays, electronic noticeboards and other displays.

The 80 demonstration pages and the display program are good for familiarising yourself with how a viewdata



system operates, but the main aim of *Edfax* is to enable you to create your own pages and display them. The success or otherwise of any private viewdata system depends on how easily this can be done – that is, how easy the editor is to use.

The editor is a machine-code program and is copy protected. In a classroom, therefore, the program would have to be loaded into each computer in turn from the master disc – no back-ups can be made. On running the program you are asked to insert a data disc into the drive. This is the disc on which you want to save your pages, and a blank, formatted disc will be prepared to accept up to 80 pages (or 180 with an 80-track drive). As the Acorn DFS cannot support 80 different files, the editor at this point creates a single large datafile called PAGES, which is initially empty.

Next, a menu appears and you can



edit or create a page, display a page, display the directory of page numbers, or exit. On choosing the first option you are prompted for a page number: if it already exists the page will be loaded in for you to edit; if not, the screen goes blank and you are ready to create your first page.

At first sight the editor works much like any other on-screen editing system: you move the cursor around with the arrow keys and the typed text appears as white characters on a black background. When it comes to using the various viewdata attributes things get more complicated, however. These are selected using the BBC's red function keys; for example, to get the word 'HELLO' flashing in yellow letters, you press f2 (for yellow text), f8 (for flash on), and then type 'HELLO'. Other attributes change the background colour and select double-height characters, but they each occupy one 'invisible' character space in front of the text. This is an important point, because deleting the 'hidden' yellow text attribute in the example above will cause the text to revert to white.

To the novice these viewdata attributes can be a bit confusing, but the *Edfax* editor helps, to some extent, by



printing a message on the top line of the screen when the cursor is over one of these invisible attribute characters. Two final points: attributes apply only to text entered on the same line and only for text to the right of them.

Pages composed only of text are all right, but by adding graphics they can be made more interesting. Viewdata graphics are produced by first selecting a graphics colour – the 'shifted' function keys – and pressing any of the lower-case or numeric keys. Each key produces a graphics character based on a 3 x 2 pixel grid, but to find out what key gives which graphics character involves continually referring to the back of the *Edfax* manual. This can become very wearisome, especially if a lot of graphics are required.

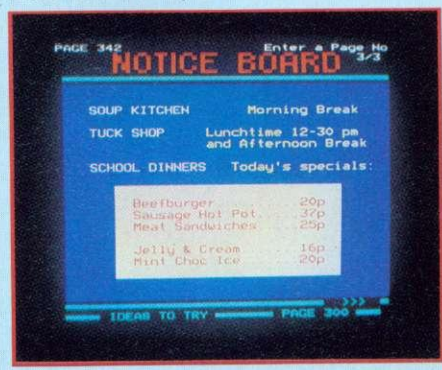
As an alternative, it is possible to construct a graphics character from the individual pixels by selecting the 'Define Pixel' mode. If you look at a keyboard, the keys e, r, d, f, c and v form a 3 x 2 rectangle, and these are used to turn on or off the six pixels making up the graphics character. This method is useful if you are not sure which graphics character would best suit a particular part of a picture, but it would be too laborious to make up all the graphics characters in this way.

The *Edfax* editor could do with some



extra features: there is no method of inserting characters, for example – very frustrating if you have just done a page heading and then find it's not quite centred. Similarly, there are no facilities for moving or copying blocks of characters, or for inserting or deleting lines. These omissions are a result of *Edfax*'s having been designed primarily for schools, where ease of use counts for more than sophistication, and Tecmedia is apparently working on a Mark 2 version with more advanced editing facilities, as well as a suitable screen dump routine for printers.

Having created your page you can save it on disc, either with the same



number as that used to load it – and thereby deleting the old page – or with a different page number. You are also asked for a 'cycle page number' – the number of the page you want to follow yours in the 'carousel'. If you don't want the page to cycle you supply the number '000'.

The possible applications for *Edfax* are limited only by the imagination of the user. In schools, a group of children could produce an 'electronic newspaper', or a specialised database could be created for a history project; a high street shop could install a BBC in its front window and advertise the week's special offers.

To summarise, *Edfax* serves as a

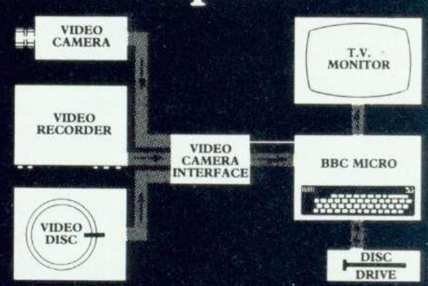


relatively cheap and simple introduction to the world of viewdata systems. The display program and sample database of pages nicely demonstrate the concept without the expense of teletext adaptors or modems. The editor is not particularly sophisticated, and the graphics are tedious to use, though this is a problem inherent in any viewdata editing system.

Previously, the software to set up a private viewdata system has cost several hundred pounds and required dedicated terminals. *Edfax*, at just £30 and running on a BBC micro, changes all that and will further encourage the growth of viewdata systems.

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TEACHING INFORMATION THE SOFT WAY

Packages are becoming available that can turn the classroom into a microcosm of the wider world of information exchange. Jean Beck sorts them out

IN THE world at large, information handling, communications and storage have become immensely sophisticated involving automation and advanced electronic engineering. Moreover, the new approach to information is widespread, affecting many corners of our everyday lives. Communications advances now make it possible to patronise famous Oxford Street stores without leaving your home. Goods can be ordered 'electronically', entering the appropriate credit card number and awaiting delivery of the goods. With the right program and a modem link through the telephone system, this is possible with most home computers.

Customers in banks use information technology to withdraw cash and order statements and cheque books. The travel agent avails himself of it to check hotel reservations, book flights and transfer payments. The Nottingham Building Society has won new customers by offering investors who maintain a minimum sum in their accounts with the necessary technology in their homes to conduct all their transactions electronically.

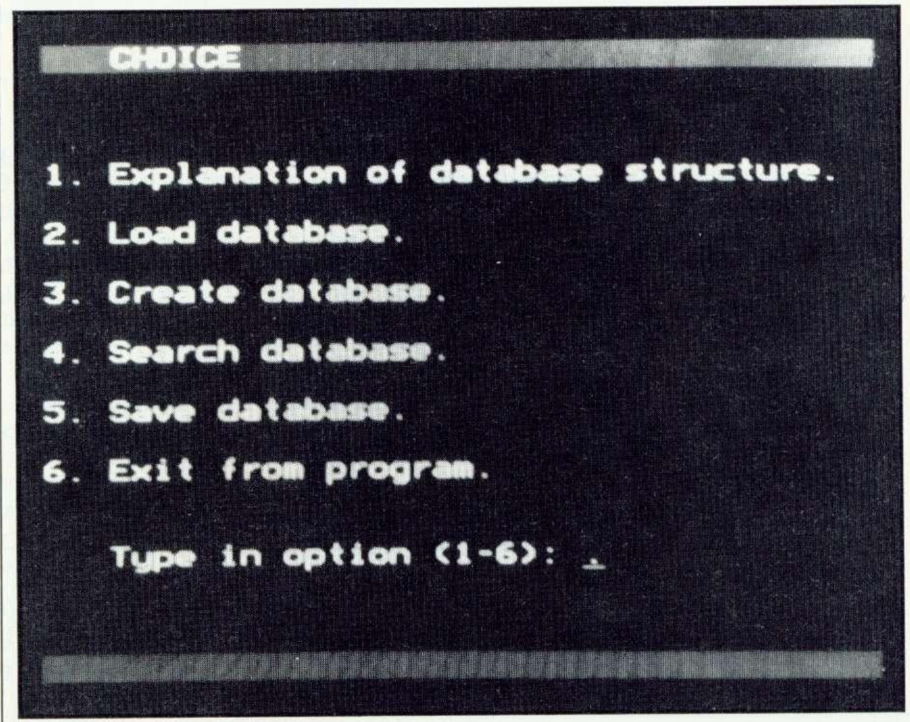
But information technology has potential outside directly commercial transactions, too. The public library, for example, is now equipped to provide a variety of information sources. As well as traditional reference such as encyclopedias, trade directories, indexes, a terminal may be available to access an on-line database, such as Prestel, which is being constantly updated.

Despite the infusion of communications technology within society, information handling and communication in schools is still largely limited to reading, writing and talking, while information storage is confined to hand-written notes and printed books. Information and communication have always been a substantial part of teaching and learning, with implications right across the curriculum.

The technological revolution cannot therefore be ignored by educationalists. A recent survey estimated that more than one in ten homes in the UK now have a microcomputer, and this figure is growing.

But integrating the new technology into schools presents problems, not least because of the speed with which it has arrived. Older teachers are often unwilling to come to grips with the unfamiliar technology of what the Department of Industry defines as 'The acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a microelectronics based combination of computing and telecommunications'. And even teachers graduating in the 1980s may know nothing about this technology.

All this points to the need for a broad training programme, producing not only teachers in the specialist subjects of information technology and computer studies but bringing all teachers up to date with the relevance of infor-



Sample from an initial database menu

mation technology to what they are teaching.

Pupils have always needed to be able to handle information and to communicate, and a good secondary education lays the foundation for independent information handling and retrieval by showing them how to use written reference sources. Even at this comparatively straightforward level, however, many pupils use these unselectively or inappropriately when completing project work.

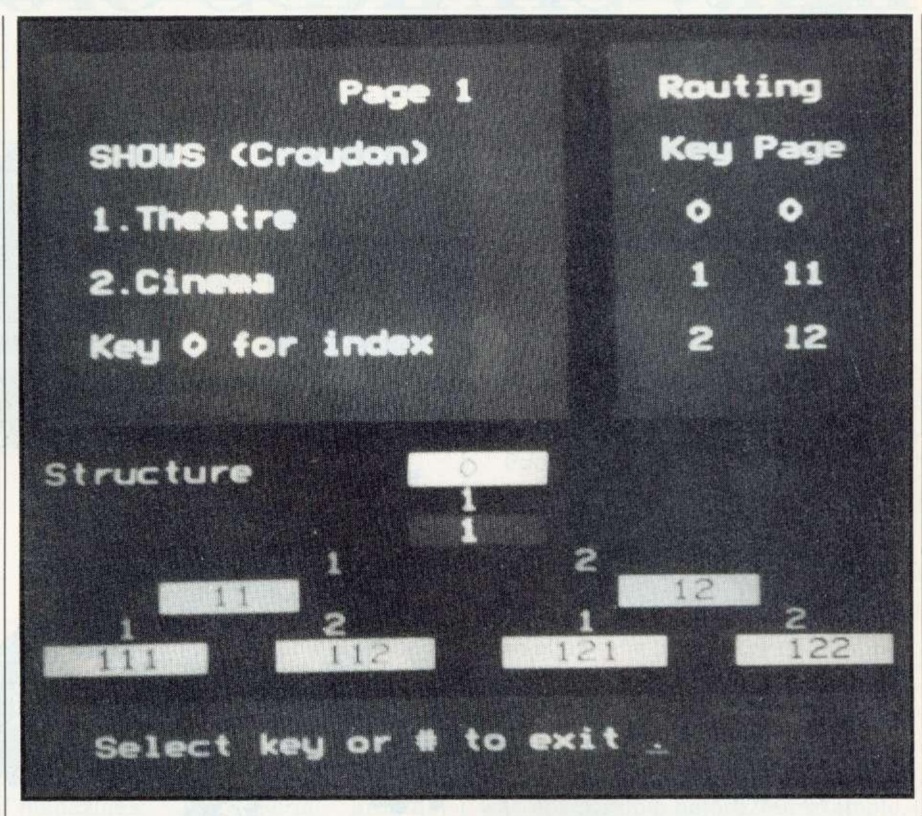
Students now need to be aware of the new technology, its potential and limitations, and they need to develop the right kind of skills to survive in a society whose transactions are conducted through information technology. There are vast resources of information from outside sources to which the microcomputer in the classroom, serving as a terminal, can have direct access – and many schools have set up their own databases. The development of information technology skills therefore becomes a matter of urgency.

These skills need to be reinforced and developed across the curriculum and throughout the child's school life, and this can happen only as a result of a coherent education policy. Careful thought must be given about how micros can contribute to both the traditional and the new aims of education. The following aspects of information technology should be highlighted:

- **Accessing** information – Sources can only be accessed if one knows it exists, has an idea of the sort of information available and knows the searching strategy required for that source.
- **Evaluating** information – Children must be given criteria by which they can evaluate information. There is a great tendency to accept as gospel information on the screen, and pupils need to be aware that what is read on a screen has been put there by an information provider.
- **Manipulating** information – Technology allows us to manipulate facts in a way that has never been possible before. Pupils need to be shown the potential in this area.
- **Distributing** information – Electronic methods of communications such as electronic mail are changing the ways in which information is distributed.

Thanks to the Department of Trade and Industry's scheme to put a micro in every secondary and primary school – an ambition now virtually achieved – there is enough technology in schools to get started, plus the programs that allow us to introduce schoolchildren to the concepts of information storage, retrieval and manipulation. The BBC micro is particularly well-equipped in this respect, with software that satisfies the aims of using microcomputers in education as ennumerated by Daniel Chandler in the teacher's handbook for Factfile, a suite of programs provided as part of the Microelectronics Education Programme. Chandler's priorities were:

- To introduce the computer as a versatile, subject-independent learning aid.
- To provide a teaching tool that will be of use in stimulating discussion,



Tree structure of a database showing diagramatic routing

SOFTWARE SOURCES

The MEP *Microprimer* pack is available from Tecmedia, 5 Grandby Street, Loughborough LE11 3DU (tel: 0509 230248) at £107.49 (£49.93 for schools) until July 1, when the price rises to £118.28 (£55).

***Factfile* pack from the Cambridge Micro Software division of Cambridge University Press (tel: Cambridge 64122). Price: £15 plus VAT. This was reviewed in the March issue.**

***Quest*, an information handling package, is obtainable from the Advisory Unit for Computer Based Education, Endymion Road, Hatfield (tel: Hatfield 65443). The tape version costs £15 and the disc £17 (including p&p).**

***Dataprobe* A double pack under preparation at Addison Wesley, Finchampstead Road, Wokingham, Berkshire RG11 2NZ (tel: 0734 794000) aimed at the 10-12 age group. Price yet to be decided. Probably available in late autumn.**

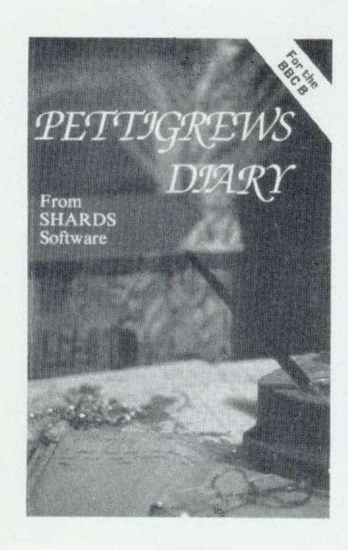
***Edword* (16k ROM) from Clwyd Technics, Unit 4, Antelope Industrial Estate, Rhydymwyn, Clwyd CH7 5JH. The Teacher Pack costs £18.95 (£21.95 disc); User Pack £38.95 and Starter Pack £56.95 (£59.95) – all excluding VAT.**

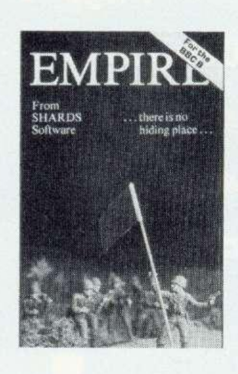
***Wordwise* (8k ROM) from Computer Concepts, 16 Wayside, Chipperfield, Herts WD4 9JJ (tel: 09277 69727). Price: £46 (incl VAT and p&p).**
***Prestel emulator* from the Independent Schools Microelectronic Programme (ISMEC), Westminster College, Oxford OX2 9AT (tel: Oxford 725904). Price: £19.95 for disc and manual.**

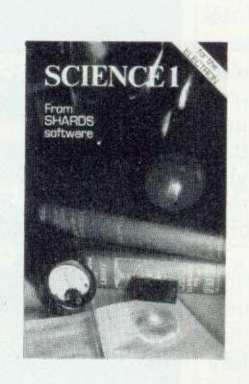
The Nottingdale ITEC *local viewdata package* is being prepared by the ITEC Consultancy and will be available through Acornsoft in September.
***Edfax* is available from Tecmedia at £34.68 (see review on page 108 of this issue).**

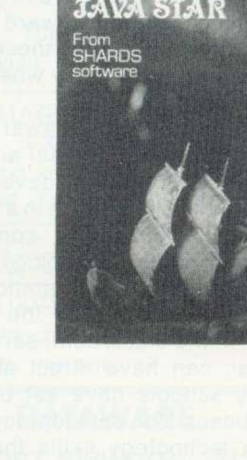
For little Acorns Mighty SHARDS Grow

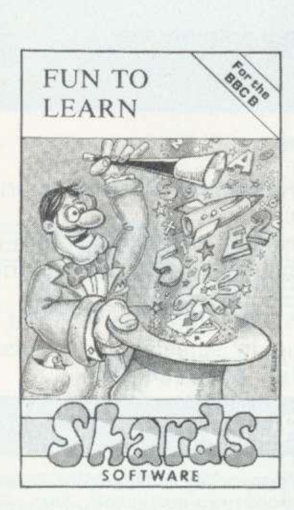


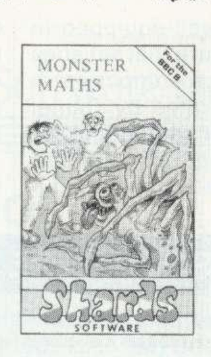




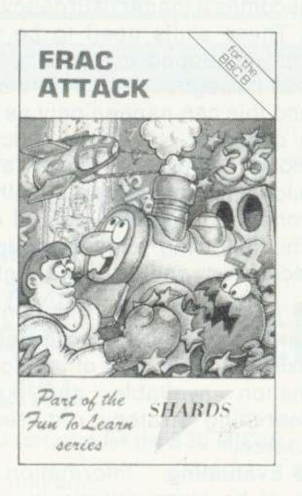












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encouraging creative writing and in preparing project work.

- To encourage the skills of ordered thinking and organising information.
- To enable children to assess the results produced by a computer and to be aware of the limitations of these techniques.

The following programs provide information handling and communication on the BBC micro:

- Factfile, Quest or Dataprobe to store and manipulate information.
- Edword or Wordwise to enable word processing.
- The ISMEC or Nottingdale ITEC packages, which allow the BBC micro to be linked to another computer and serve as a terminal for electronic mail or to access vast databases stored on remote mainframe computers, or to link schools in an area together on a local viewdata system.
- Edfax to simulate a teletext system.

In conjunction with the DoI, the Microelectronic Education Programme sponsored a two-year project in Croydon to develop an IT curriculum for the 9-14 age range. The Croydon project aims to ensure that the educational needs spelt out by Daniel Chandler are met by producing pupil material, including software, for years 1 to 3 of the secondary

'Teachers prepared to learn with children find it rewarding'

school. The first fruits of the project, six booklets with accompanying software and teacher's guide, are being published in September by Addison Wesley, followed by a second set in April 1985.

The first booklets deal with information handling, information skills, and information retrieval. The materials and the programs have been designed to introduce pupils to the basic concepts, develop an awareness of the potential and limitations of technology, and develop the skills to exploit more fully the programs mentioned above. The entire course can be followed, or specific sections considered relevant at the time may be selected.

Two of these booklets provide a framework within which each pupil can develop into an independent and flexible information handler. Experience shows that the technology can unlock previously unseen potential in some slower learning students. For example, word processing allows anyone to produce almost perfect work. Less able pupils can build up a folder of neatly printed, corrected, work much more quickly than previously.

The booklet on information skills has a value beyond the scope of an IT course and can be used in any situation where project work is being used.

The series also deals with databases as applied in many situations in school, for example in history with census

'Information may be retrieved very quickly to answer a question'

materials; in science with databases on energy, pollution, periodic tables; in careers information; fiction and literature databases in English; and weather statistics in geography. They also, of course, serve as information providers in general through electronic school magazines. The *Serial* program demonstrates a simple database which stores data in simple tabular form. It allows serial access to a small number of records which can all be displayed on the screen simultaneously: *Link* demonstrates how pointers can speed searching the file; and *Invert* shows the use of inverted files as used in keyword databases.

With *Invert*, all the database can be seen on the screen but this still allows sufficient data to show how the price paid for inverting the file is offset by the immense increase in speed of access. It is hoped that pupils will move from this simple demonstration to using the British Library SIR program when it becomes available on the BBC.

Pupils should gain experience of viewdata systems, whether through local networks or British Telecom. The *Tree* program starts with a simple tutorial on hierarchical data structures, with the VDU used as an overhead projector. The main part of the program then allows the user to create a simple Prestel-type database including all routing between the pages.

Information technology gives the teacher another tool in helping pupils to manipulate information in a way that was not possible before. For example, information may be retrieved very quickly to answer a particular question and then displayed visually using programs which create maps or scattergrams.

Some teachers will feel that they have not had enough training or time to come to terms with the technology themselves, and so may be hesitant

'Pupils should gain experience of viewdata systems'

about using it with a class of pupils. However, the basic concepts of information and communication remain the same. Experience has shown that teachers who are prepared to learn with the children find it a very rewarding experience.

Teachers have a professional responsibility to ensure that they educate children for today's world. These materials aim to provide a basis from which to start, introducing pupils to the concepts of IT, rather than to specific equipment and programs, to help them make IT work for them.

Jean Beck is the Communications and Information Studies Co-ordinator for Capital Region of MEP and is based at Kingston Polytechnic. Paul McGee is consultant to this series.

POINTS TO REMEMBER

1. Information skills are as much basic skills as literacy and numeracy.
2. Schools cannot opt out of the information technology revolution – it is here to stay.
3. Schools should plan ambitious courses even though their current equipment is inadequate.
4. Information technology teaching should use the technology to produce confident and competent flexible thinkers and independent learners.
5. Pupils must develop a critical awareness of the value of information provided by various sources.
6. There is no need to invent uses for information technology when so many are seen in everyday life.
7. IT opens new possibilities for pupils of all abilities, and teachers must not be frightened to allow the pupils to develop independently.
8. Teachers can find learning with their pupils, rather than always teaching them, a rewarding experience.
9. The full benefits of an IT curriculum will be obtained only in a school which has a comprehensive and coherent policy.

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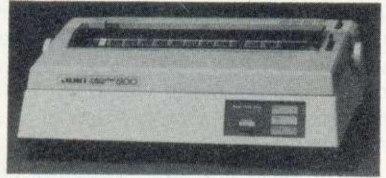
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20 CPS Unidirectional, 10.12.15 CP1	£260 + VAT = **£299**

SMITH CORONA TP1

12 CPS, 10.12, CP1, unidirectional	£208 + VAT = **£239**

PROFESSIONAL MONITORS

*SANYO
*MICROVITEC
*FIDELITY
*PHOENIX

SANYO

DM8112 12" Green screen 18 MHZ Hi-Res	£86 + VAT = **£99**
DM2112 12" Green screen 15 MHZ Monitor	£66 + VAT = **£75**
CD3125 14" RGB Normal Res. Colour Monitor	£173 + VAT = **£199**
CD3117 14" RGB Medium Res. Colour Monitor	£286 + VAT = **£329**
CD3115 14" RGB High Res. Colour Monitor	£391 + VAT = **£449**

MICORVITEC CUB

1431 MS 14" RGB Normal Res. Colour Monitor	£173 + VAT = **£199**
1451 MS 14" RGB Medium Res. Colour Monitor	£321 + VAT = **£369**
1441 MS 14" RGB High Res. Colour Monitor	£417 + VAT = **£479**

FIDELITY Colour Monitor

CM14 14" RGB, RGBY Composite sound col.	£187 + VAT = **£215**

PHOENIX

Phoenix High Res. 12" Green Monitor	£66 + VAT = **£75**
Phoenix High Res. 12" Amber Monitor	£69 + VAT = **£79**

BBC MICROCOMPUTER SYSTEM

WE ARE AN OFFICIAL BBC COMPUTER DISTRIBUTOR

DEALER ENQUIRIES ARE WELCOMED

Acorn Electron £199 INC VAT

WE SUPPLY FREE 30 HOUR BASIC BOOK AND A DUST COVER WITH EACH BBC COMPUTER

BBC is the best microcomputer currently on the market. 32K RAM, 32K ROM, 8 modes of operation, full colour, full-size keyboard, internal expansions such as disc interface, speech synthesizer, Econet interface – In short it is a personal computer capable of expanding into a small business system.

BBC Microcomputer Model B	£348 + VAT = **£399**
BBC Mod B - disk interface	£409 + VAT = **£469**
BBC Mod B - Econet interface	£389 + VAT = **£447**
BBC Mod B - disk and Econet interfaces	£450 + VAT = **£517**
BBC 100K disk drive	£230 + VAT = **£264**
BBC dual 800K disk drive	£699 + VAT = **£803**
Torch Z80 disk pack including Z80 2nd processor, 64K RAM and CPN operating system + Free Perfect Software	£696 + VAT = **£799**
BBC Teletext receiver (Aug)	£196 + VAT = **£225**
BBC cassette recorder and lead	£26 + VAT = **£29**
Disk interface kit (free fitting)	£84 + VAT = **£96**
Mod A to Mod B upgrade kit	£70 + VAT = **£80**
Fitting charge for A to B upgrade kit	£20 + VAT = **£23**
16K memory upgrade kit	£30 + VAT = **£34**
Games paddles	£11 + VAT = **£12**
12" Monochrome monitor incl. cable	£89 + VAT = **£102**
14" Colour monitor incl. cable	£199 + VAT = **£22**
User guide	£10 + VAT = **£10**
Econet interface (free fitting)	£60 + VAT = **£69**
Speech interface (free fitting)	£47 + VAT = **£54**
BBC disk manual - formating disk	£30 + VAT = **£34**
Parallel printer cable	£10 + VAT = **£11**
BBC word processor (view)	£52 + VAT = **£59**
BBC Fourth language cassette	£15 + VAT = **£17**
BBC Lisp language cassette	£15 + VAT = **£17**

APPROVED ECONET SERVICE CENTRE

WE STOCK A LARGE RANGE OF SOFTWARE FOR BBC MICRO INCLUDING ACORNSOFT/BBC SOFTWARE/LONGMANS SOFTWARE PLEASE SEND LARGE STAMPED ADDRESSED ENVELOPE FOR FULL DETAILS

TORCH Z80 2nd PROCESSOR
For only £347 + VAT

Torch 2nd Processor Z80 is supplied with perfect writer (a powerful Word Processor), perfect speller (spelling checking program - I should have used one for making this advert!), Perfect Filer (A Database Program), Perfect Calc (Spread Sheet). It includes 64K memory (Almost 60K available to user). Fits inside BBC Computer

Z80 2nd Process + Perfect Software	£347 + VAT = **£399**
Z80 Processor + Perfect Software + Dual 800K Disk Drives	£695 + VAT = **£799**

GUARANTEED LOWEST PRICES

100% BBC COMPATIBLE MITSUBISHI AND TEAC SLIMLINE DISK DRIVES



NEW LOWER PRICES!

These drives are supplied ready cased with all the necesary cables, formating program and User Guide.
There are some very useful utilities included on formating disc e.g.

* DISASSEMBLER: This is 6502 machine code disassembler.
* DUP: To copy and rename a file on disc.
* FORMAT: Formating program for 40 & 80 tracks.
* FREE: This utility provides a disk usage analysis.
* MDUMP: Enables you to display and modify any part of BBC memory.
* MERGE: Merge a number of text files into one file.
* RELOCATE: Downloads a basic program to &E00.
* SDUMP: Screen dump for EPSON in all graphic modes.
* VERIFY: Verifies every sector on a disk.
* MENU: A flexible menu program.

Single drive 100K 40 trks, single Sided	£147 + VAT = **£169**
Dual drive 200K, 40 trks, single sided	£286 + VAT = **£329**
Single drive 200K, 40 trks, double sided	£173 + VAT = **£199**
Dual drive 400K, 40 trks, double sided	£330 + VAT = **£379**
Single drive 400K 80 trks, double sided	£199 + VAT = **£229**
Single drive 400K 40/80 trks, switchable, DS	£217 + VAT = **£249**
Dual drive 800K 80 trks, double sided	£382 + VAT = **£439**
Dual drive 800K 40/80 trks, switchable, DS	£408 + VAT = **£469**

All above drives are low power slimline. (0.3 A typ. at + 12v and 0.4 A at + 5v per drive). Normally extra power supply is not required, the BBC Computer power supply is designed to drive two low power drive (IT IS NOT DESIGNED TO DRIVE INTERNAL ROM BOARD)

40 Track SS/DD disketts (10/Box)	£18 + VAT = **£20**
40 Track DS/DD disketts (10/Box)	£23 + VAT = **£26**
80 Track SS/DD disketts (10/Box)	£28 + VAT = **£32**
80 Track DS/DD disketts (10/Box)	£30 + VAT = **£34**

ALL ABOVE DISKETT ARE CERTIFIED EITHER MEMOREX OR DETALIFE

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BUSINESS SYSTEMS ENQUIRIES	DENNIS SUTCH
EXPORT ENQUIRIES	MAHAMAD EDIB
ECONET SYSTEM TECHNICAL ENQUIRIES	ALAN LAFFOLEY
ACCOUNTS	CARON ANDREWS
DESPATCH	PAUL SWIFT
REPAIRS	JOHN MAULE

Prices Correct at the time of this advertisement going to press.

BUSINESS SYSTEMS



APRICOT — SIRIUS — SANYO
IBM — TEXAS — TORCH

APRICOT "Portable Executive Computer", 16 Bit Micro, 256K RAM, up to 1.44 megabytes floppy disk storage. 3½" Sony disks. Portable brief case styling. Modem with auto dialler (optional) hard disk optional. Vast software library (compatible with Sirius 1)

Apricot with Single Drive and Motitor	£1690 + VAT
Apricot with Double Drive and Monitor and Free Printer or 2nd Monitor	£1890 + VAT

SANYO PROFESSIONAL COMPUTER
16 Bit Micro 128K RAM expandable to 256K. Single or Double Disk Drive built in full colour graphics (640 x 200 pixels in 8 colours) IBM compatible. Free software, Sanyo MBC 550 128K RAM single drive and free software Including Wordstar and Calcstar — £749 + VAT
Sanyo MBC555 128K double drive and free software including Wordstar, Calcstar, Inforstar Datastar etc. — £999 + VAT

SIRIUS 1 Sirius 1 Computer with 128K RAM and 1.2 megabyte Floppy disc storage including CP/M 86, MS DOS and Microsoft Basic — £2195 + VAT

Sirius 1 Computer with 256K RAM and 2.4 megabyte Floppy disk storage Including C C/M 86 MS DOS & Microsoft Basic — £2895 + VAT

TORCH
CF500 COMPUTER with colour monitor includes Twin 400K disks, Torchnet Operating System free perfect software (perfect writer, perfect speller, perfect calc perfect filer). Torchmail Plus (Electronic Mail). Torch Mars (Financial modelling with graphics). Torchtel (Viewdata Access System) Executive Aid (Menu System).
Datel 600 (Link to outside mainframe services i.e. Telecom Gold) — £2950 + VAT

TEXAS INSTRUMENTS PROFESSIONAL COMPUTER
TI 502 Dual 320KB Drives 256K RAM. Up to 10 megabyte on board storage possible TI speech command hardware option brings a new level of user friendliness to computing. Allows voice operated keyboard control (Optional) — Price £2650 + VAT

MAINTENANCE CONTRACTS ARE AVAILABLE.

COMPLETE WORDPROCESSING SYSTEMS INCLUDING DAISYWHEEL PRINTER
From £695 + VAT



SYSTEM 1 BBC Micro model B, Wordwise, Phoenix monitor, Smith Corona TP1 Daisywheel Printer, Cassett Recorder + all the necessary cables and documentation — £696 + VAT = **£799.25**

SYSTEM 2. BBC Micro model B + Disk Interface, Phoenix Monitor, 100K Single Disk Drive, Wordwise, Smith Corona Daisywheel Printer. + all the necessary cables and documentation. — Price only £895 + VAT = **£1029.25**

SYSTEM 3. BBC Micro model B + Disk Interface, Phoenix Monitor, Dual Disk Drives 200K, Wordwise, Smith Corona Daisywheel Printer + all the necessary cables and documentation. — Price £999 + VAT = **£1148.85**

SYSTEM 4. BBC Micro model B + Disk Interface, Sanyo High-Res Green Monitor, Wordwise (or view), Juki 6100 Daisywheel Printer, Single 400K Disk Drive + all the necessary cables and documentation. — £1049 + VAT = **£1206.35**

SYSTEM 5. BBC Mod B Micro + Disk Interface, Sanyo High Res Green Monitor, Wordwise (or view), Juki 6100 Daisywheel Printer, Dual Disk Drive 800K + all the necessary cables and documentation. — Price £1195 + VAT = **£1374.25**

SYSTEM 6. Sanyo 16 Bit, IMB pc Compatible Micro, 128K RAM, Single Disk Drive 160K, Wordstar, Calc Star, Sanyo High Res. Green Monitor, Juki 6100 Daisywheel Printer + all cable and documentation. — Price Only £1145 + VAT = **£1316.75**

SYSTEM 7. Sanyo 16 Bit, IBM pc Compatible Micro 128K RAM, Dual Disk Drives 360K, Wordstar, Calc Star, Mailmerge, Infostar, Spellstar Datastar, Sanyo High Res Green Monitor, Juki 6100 Daisywheel Printer + and all necessary cables and documentation. — Price £1395 + VAT = **£1604.25**

SYSTEM 8. All the components of System 6 but with Sanyo High Res Colour Monitor and Wordstar with Colour Facilities. — Price £1445 + VAT = **£1661.75**

SYSTEM 9. All the components of System 7 but with Sanyo High Res Colour Monitor and Wordstar with Colour Facilities. — Price £1695 + VAT = **£1949.25**

WE CAN ALSO SUPPLY PACKAGES WITH COMPONENTS OF YOUR OWN CHOICE. PLEASE PHONE (0279) 412639 AND ASK FOR HAMAYUN MUGHAL FOR A PRICE.

AKHTER INSTRUMENTS LTD. T/A



COMPUTER GROUP

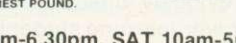
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N.B. ALL VAT INCLUDED PRICES ARE THE CORRECT PRICES. EXCL. VAT PRICES HAVE BEEN ROUNDED UP TO NEAREST POUND.

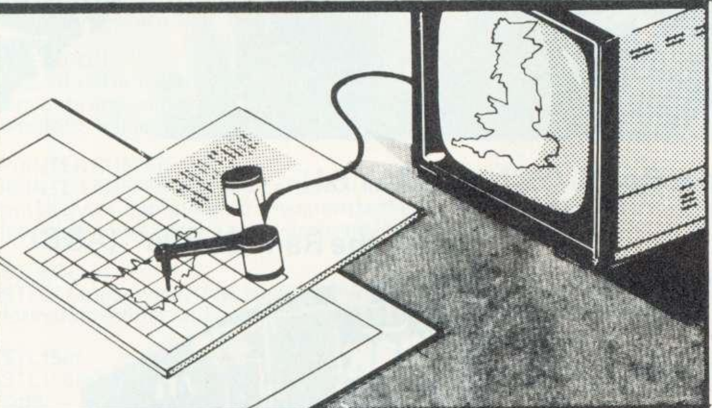




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We welcome callers, no parking problems.

Robot Plotter

£59.50 INC. VAT
CARRIAGE £3.00



- ★ FOR BBC MICRO MODEL B CASSETTE OR DISC
- ★ ENABLES PICTURES TO BE DRAWN OR TRACED
- ★ WORKS IN ANY GRAPHICS MODE — COLOUR SELECTABLE
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AT LAST. THE VITAL LINK BETWEEN PHYSIOGICAL DATA AND YOUR BBC MICRO.

The Harvard Universal Data Interface is a transient store that links the BBC Micro to an oscilloscope, a chart recorder, a dot matrix printer, a biological pre-amplifier, a human subject, a biological preparation, a stimulator, an X-Y plotter, a TV monitor and a disc drive.

The Universal Data Interface:

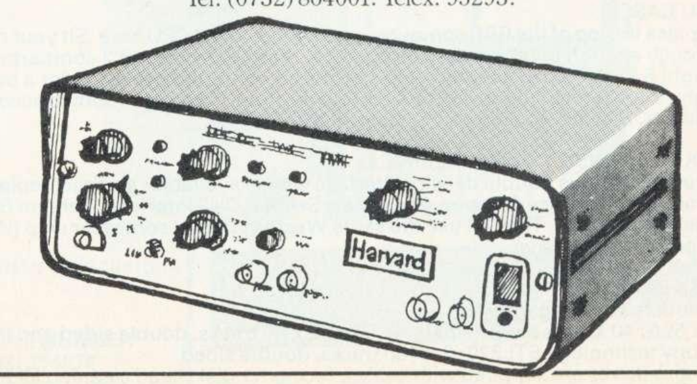
- Accepts analogue data in the frequency range DC to 6KHz.
- Typical applications include ECG, EMG, EEG, Evoked Response Extra-cellular and Intra-cellular recordings.
- Has available a complete range of software.
- Costs just £450. (exc. VAT P&P extra).

For full details contact Harvard Apparatus at the address below.

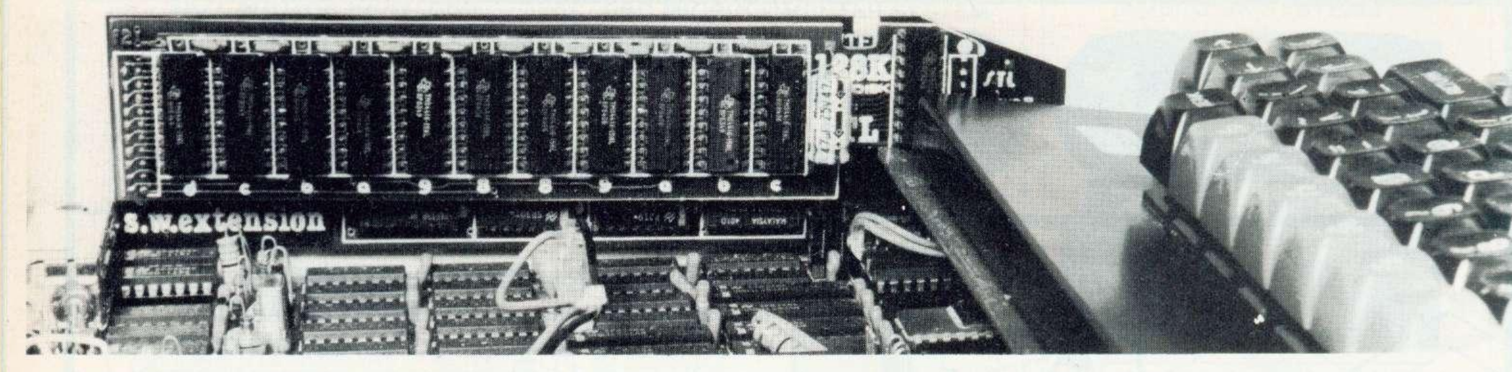


FURTHERING THE REALMS OF RESEARCH.

Harvard Apparatus Ltd., Fircroft Way, Edenbridge, Kent TN8 6HE.
Tel: (0732) 864001. Telex: 95293.

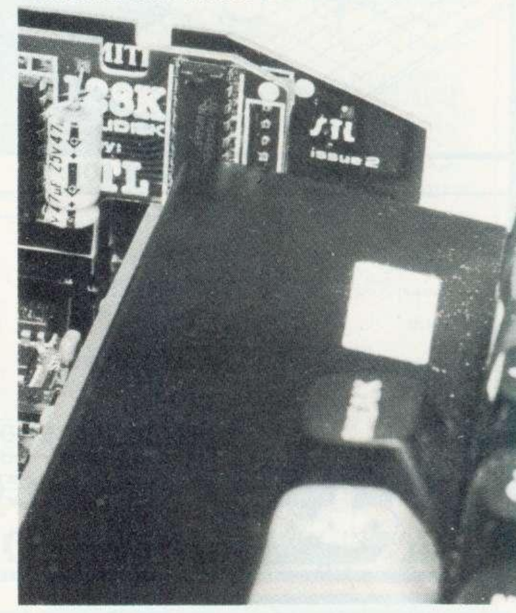


SOLIDISK SIDEWAYS RAM: 8,000 UNITS SOLD



"Exciting" (ACORN USER JAN 84), "Power to your Beeb" (PCN 61, MAY 84)

"Break the Ram Barrier" (A&B)



HOW ABOUT COMPATIBILITY?
The Sideways RAM is completely compatible with all issues of BBC computers, disks, all sideways ROMs, second processor, Torch disk pack, Teletext, Econet etc. but NOT with ROM extension boards, since it can replace them.

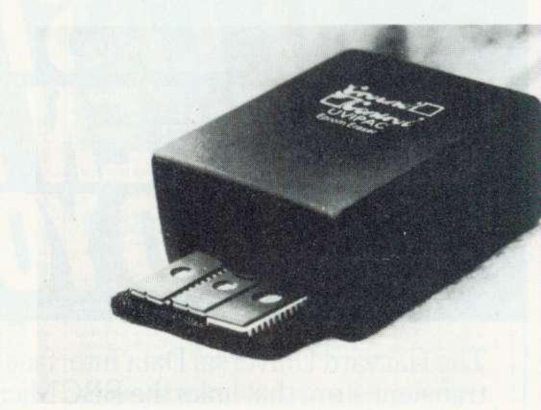
Its power consumption is so low that you can use it in conjunction with twin disks.

HOW DOES IT WORK?
Occupying the same place as sideways ROMs (such as BASIC, DFS, CPN etc), it is treated like other Sideways ROMs and therefore can replace them.
The Machine Operating System uses Sideways RAMs as naturally as Basic, without procedures or programming rules.
Sideways RAM can run any language, any filing system including Hi-Basic and second processor DFS.

SIDEWAYS RAM POWER IS IN THE SOFTWARE:
Different from Sideways ROMs, Sideways RAM can be written into. This property gives birth to a NEW GENERATION of software for the BBC computer: SERVICE RAMs and VIRTUAL MEMORY PROCESSOR.
Each SERVICE RAM has its own commands and code as its counterpart Sideways ROM but has its own private workspace and storage area thus leaving you with the lowest possible PAGE value (PAGE=&EOO). On the other hand, the Virtual Memory Processor can run huge MACRO BASIC programs (Megabytes are not the limit), keep them on disk and uses the basic 32k of RAM as transient program area. All software for the Sideways RAM system is free.

FREE SOFTWARE?
Solidisk Sideways RAMs is bundled with lots and lots of software, FREE and we mean FREE, now and later. It is quite simple: for every Sideways RAM sold, £1 is spent on MORE software. Sideways RAM users are invited to spot new applications and contributions are rewarded at the usual rate of £1 for every 4 bytes of machine code.
The result is printed on the opposite page.

UVIPAC EPROM ERASER



HOW ABOUT THE FUTURE?
Solidisk Sideways RAM is also widely used in schools for ECONET stations, by professional programmers for writing programs, research laboratories for RAM disk data base, at home for wordprocessing and now even games.
New areas are being developed: Telesoft and Teletext logging, Speech Processor assembler and Relational Data base to cite a few.
As the price of 16k EPROMs are as high as £20 at the present time, more Sideways ROM software publishers will be willing to sell their software on disk. Solidisk will mail FREE OF ANY COST their advertisement to ALL Sideways RAM users providing the price of the Disk version reflects savings in the cost of the ROMs. Solidisk believes that the majority of BBC users will have their Sideways RAM fitted before the end of next year.
Also unlike other makes (SIR, APTL, WE Sideways ROM/RAM extension boards and the Aries B20), Solidisk Sideways RAM is expandable from 16k right to 128k and now to 208K.
As a result of VLSI technology and volume of sales, Solidisk products also have a lower shop price than any other products.

OTHER PRODUCTS FROM SOLIDISK:

UVIPAC EPROM ERASER:
Uvipac is powered by the mains, simple to operate and can erase 3 Eproms of any type in just 15 minutes. Uvipac is ideal for home use.

TEAC DISC DRIVES FD55 Series



DETACHABLE KEYBOARD CASE:
Remove the keyboard from the BBC computer and instal it in the new case. Replace the old 3" keyboard tail by the new 24" cable and you can work really in comfort even for very long hours. The keyboard case is more a productivity tool than just ergonomics.

CPU CASE:
Replace the top of the BBC computer case by this metal CPU case. Sit your monitor on top (it is tough enough to take even your weight!). The CPU case has 2 compartments for half height 5.25" disk drives with fixing screws, air vents and provision for a bolt-on fan. At first sight, there is no trailing wire. Looking inside, there is enough room to accomodate Teletext Adapter, Second Processor, Solidisk and a fan!

DOUBLE DENSITY DISK INTERFACE:
2 versions of this double density interface will be available: as direct replacement for the Acorn Disk Interface (Version A) and as a Second Disk Interface (Version B) adding to your existing interface. They all use the same Western Digital controller chip (WD1770).
Price £39.95 inclusive

DISK DRIVES:
3 models are being offered:
STL55A: 40 tracks single sided, SLT55F: 2 x 80 tracks, double sided and the best of mini floppy technology STL320: 2 x 160 tracks, double sided.
All disk drives are supplied with cables, formatter disk, head cleaning kit and 2 year warranty.

WHICH SIDEWAYS RAM DO YOU NEED?

Solidisk Sideways RAM is available in 16 (SWR16), equivalent to 1 sideways ROM, 32k (SWR32), equivalent to 2 sideways ROMs, 128k (Solidisk), equivalent to 8 sideways ROMs and the 208 Solidisk equivalent to 12 Sideways ROMs. You can buy a small Sideways RAM now and upgrade it later. From the SWR16 to the SWR32 is by straight exchange, from the SWR32 to the Solidisk is by adding the 96k Solidisk Extension, from 128k to 208 is by exchange of the RAM card.

FREE SOLIDISK SOFTWARE:

WORD64:
WORD 64 is a Service RAM, it uses Solidisk as storage for WORDWISE, up to 64K free characters for any text.

SILEXICON:
SILEXICON is a Spelling Checker for Solidisk. SILEX scans texts at more than a 1,000 words a minute and compares each word against the dictionary, Silexicon marks the mis-spelt words for either addition to the dictionary or eventual correction.

PRINTER BUFFER:
PRINTER BUFFER is a Service RAM, it increases 500 times the normal 32 bytes printer queue to 15K bytes, completely transparent to the user. PRINTER BUFFER is as useful for printing a long document as for a short program listing.

STLEOO:
STLOO is a Service RAM, it is Disk Filing System that leaves PAGE at &EOO, has built-in disk formatter/verifier and automatic track stepping for 40/80 track disk drives.

STL150:
STL150 is a Service RAM to enhance Acorn's .90 DFS to offer up to 150 directory entries per side.

STL-RFS:
STL-RFS (RAM/ROM filing system) is a Service RAM and an innovation in portable applications. STL RFS saves any program in a Sideways ROM format, it can then be copied onto EPROM to give instant recall of your programs. Plug this EPROM into any sideways socket, type *RFS and it runs itself. Compatible with the ELECTRON and BBC, tape and disks, SWR16, SWR32 and Solidisk.

INDEX:
INDEX is a Service RAM, it stores all the entry points of one or several sequential data files such as mailing list, stock list, accounts etc, merges, sorts them in alphabetical order and gives instant access to any record. INDEX can handle 1,100 records of any size, any type, any number of fields.

MACRO-BASIC:
MACRO-BASIC is a program generator. You use a wordprocessor to create a command file which is then scanned by MACRO. MACRO uses other programs, subroutine libraries, text files (actually any or all files on your disks) as source to generate a bug free BASIC program which can be very large (Megabytes are not the limit).

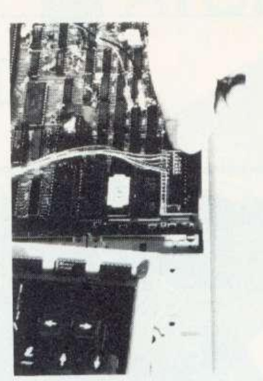
VIRTUAL MEMORY PROCESSOR:
VIRTUAL MEMORY PROCESSOR (VMP) uses extensively overlay technique and Solidisk as back store for very large programs that cannot be run otherwise. VMP uses the 32k basic RAM as transient area: it operates on a Main Program as generated by MACRO-BASIC, taking different segments from the Solidisk Store, POOL, HOLD, FREE or CLEAR segments from the transient area. For example: VMP will accept 20 segments of 10k of Basic assembler and assembles it into 16k of machine code.

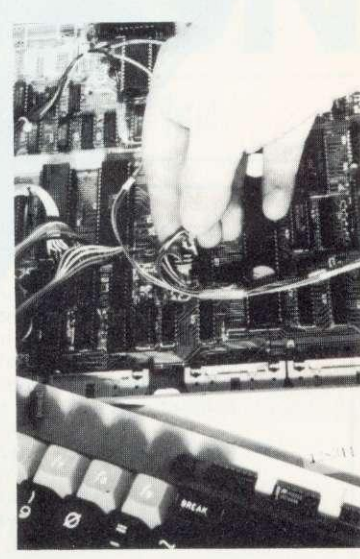
MENU:
MENU puts all computer's resources at your fingertips. MENU displays your Sideways Firmare, Disk Directories, Sideways RAM system, Solidisk System etc.

MORE FREE SIDEWAYS RAM SOFTWARE TO COME:
While others are making promises for software to be written, Solidisk Systems RAM comes with a complete, novel and powerful software package including compatibility with existing sideways software.
Each Sideways RAM is accompanied by the Sideways RAM User Manual, full 1 year warranty, 1 utility disc* and free mailing on all new publications from the Software Support Service.

*It should be understood that we cannot put as much free software on a 40 track single sided as on 80 tracks. The present software package require 160 tracks of storage and can be accommodated on ONE 2 X 80 track double sided diskette, only the most useful programs are supplied on other formats (ie 40 track single sided, 2 X 40 track double sided, 80 track single sided). Should you require the whole collection of free software, please place an order for extra disks.
For the technical minded: the Source Code and Technical Manual (3 floppies and a 300+ page book) price = £10, the SILEXICON EXTENSION PACKAGE (3 floppies and a 40 page mnual, 30,000 word dictionary: English and French now, German and Spanish planned) price = £9.00. '4S' also publishes regular updated SWR utility discs at £3.00.
Every user can do contract work for the SUPPORT SERVICE and make a lot of money for him/herself!

HOW EASY TO INSTALL:


Push in the base unit



Connect the control wires

PRICE LIST (including VAT and post & packing)

SIDEWAYS RAM:	
SWR 16K	£43.65
SWR 32K	£59.95
128K SOLIDISK	£150.95
208K SOLIDISK	£243.00
The following are upgrade prices for existing Sideways Ram owners:	
16 – 32 (please return complete item)	£18.00
16 – SOLIDISK (please return complete item)	£109.00
32 – SOLIDISK (no return necessary)	£93.00
128K – 208K SOLIDISK	£93.00
DISK DRIVES:	
STL55A (40 track, single sided, cased with cables, diskette, manual and 2 years warranty)	£142.95
STL55F (2 X 80 track, double sided, as above)	£232.95
STL320 (2 X 160 tracks, double sided, as above)	£499.00
FLOPPY DISKS (DATALIFE Verbatim):	
MD525 (SS/DD 40 or 80 track) box of 10	£16.00
MD550 (DS/DD 40 or 80 track) box of 10	£22.00
MD557 (DS/DD 98 TPI) box of 10	£27.00
CPU CASE	£13.00
DETACHABLE KEYBOARD CASE	£27.99
EPROM PROGRAMMER (used with Sideways Ram)	£16.00
UVIPAC EPROM ERASER (free standing unit)	£20.95
2764 PACK OF 5	£36.00
SOURCE CODE + TECHNICAL MANUAL	£10.00
SLEXICON EXTENSION PCKAGE	£9.00

WE STOCK A LARGE RANGE OF PRINTERS AND MONITORS. CALL OUR SALES OFFICE FOR IMMEDIATE QUOTATION.

HOW TO ORDER?
You can order any item using the coupon. Post and packing is only charged once.
Access and Barclay card holders can place their order by phone.
Educational authorities, Acorn dealers and OEMs can obtain quantity discounts.

Name:

Address: ....

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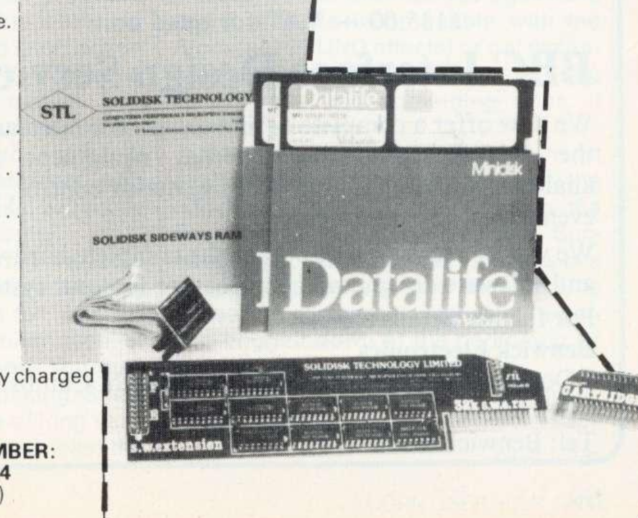
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Credit Card Account:

Callers are requested to ring first for appointment.

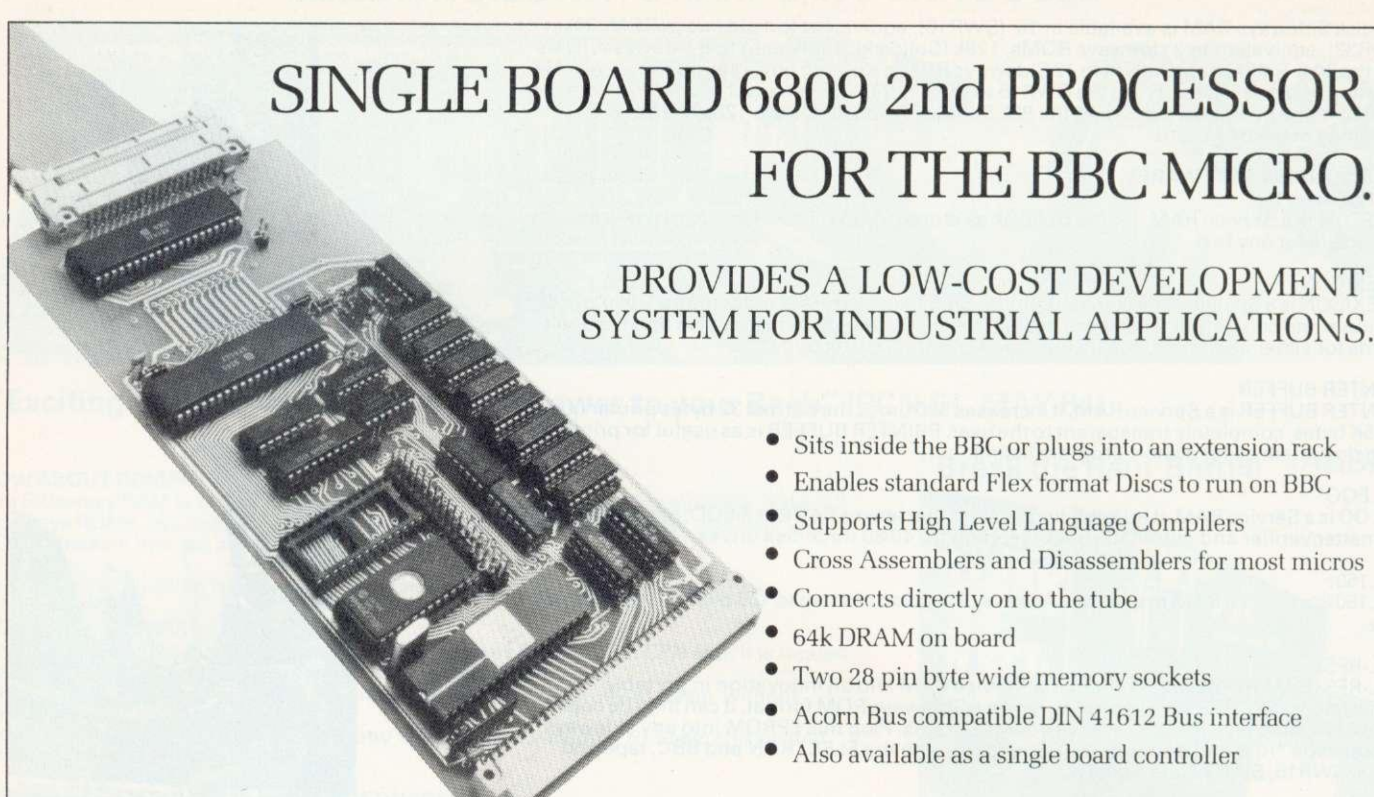
Total: £

If ordering more than one item, deduct £1 per item as post and packing cost is only charged once.



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17 SWEYNE AVE
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For full information contact Phil Taylor at:



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Cambridge
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Disc Drive Multiplexer

★ **NO SWITCHES**
★ **NO SOFTWARE**
★ **NO EXTRA CABLES OR CONNECTORS**

This is the simple low cost alternative to buying disc drives for every BBC. This unit allows the connection of up to 4 BBC Computers to the same disc drives. The operation is total automatic because it uses one of the disc interface outputs to electronically switch between computers. The computer will simply wait for access to the drives if they are in use. All the DFs commands are used as normal. It is ideal for use in schools and offices and saves having to purchase 1, 2 or 3 dual drive for about £500 each. The unit is complete with its own power supply.

Prices: £ 75.00 + VAT for dual unit
£135.00 + VAT for quad unit,

BBC Interface Design Service

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ACTION SEQUENCE FOR CONVERSION

Barry Pickles finalises his Basic translation kit

IN THE first two parts of this series we listed some of the keywords in BBC Basic, explaining how they can be converted for the Atom, and we discovered which VDU calls have an Atomic equivalent. Before we get down to actually translating a BBC Basic program into AtomBasic, however, let's consider *FX calls and the problematic conversion of machine code from one micro to the other.

A full summary of *FX calls was published in the November '82 issue of *Acorn User*. The ones that can be used are given in table 1. In conversion most calls can be ignored as, generally, they are not essential to the running of a program, even though they are performing sophisticated functions. *FX calls are also used in the form A% = &XX: CALL OSBYTE, where XX is the number corresponding to the *FX call.

*FX	Atom equivalent
6,x	?#FE = x
19	LI.#FE66
119	SHUT#
121	INKEY (see text)
132	Same as HIMEM
133	Always #8000 on Atom
134	A = ?#DF*256 + ?#DE + ?#E0
135	?A (where A is as above)
150/151	Read/write SHEILA

Table 1. *FX calls

Machine code is the most difficult of all to convert, since most machine-code routines nowadays use machine specific OS calls to save coding. The only way to deal with this is to ascertain what the code is doing (if you're lucky, from a program description) then write your own code, using Atom OS calls. You will find, in published programs at least, that the same calls are used repeatedly and with time you'll become used to them. You will also find that few non-BBC programs are in assembler format. Most POKE the op-codes and data directly into memory. If the code is for a 6502-based machine (Apple, Atari, Commodore 64, Oric, Pet, Vic) you can do this yourself, then disassemble it to see whether you can make sense of it.

You will further find that few BBC programs make direct calls to OS routines and ports; instead, they use indirection, either through block zero or OSBYTE (see above). OSBYTE corresponds to location &FFF4 and can address three blocks, known as FRED, JIM and SHEILA. FRED is page &FC, JIM is page &FD and SHEILA is page &FE. Calls to the FRED and JIM areas access the Beeb's 1MHz bus and, if the program does this, it is non-convertible.

Reading and writing to SHEILA allows access to various internal chips and conversion may be possible if you know what it's doing. One area of memory that can be easily converted is associated with the user port (VIA), mapped at &FE60–&FE6F, directly corresponding to £B800–£B80F on the Atom. Calls are made through the A and X registers. A% = &96 performs a read, while A% = &97 does a write. The X register is used as an offset from &FE00, thus:

```
LDA £&96
LDX £&60
JSR &FFF4
```

reads location &FE60, which is port B of the VIA.

Converting machine code is a matter of practising until you get proficient at it.

To convert a program successfully, it helps to follow a plan of action.

First, read through the program, using the outline description if there is one, and break it down into short action sequences, writing each one down and the line numbers where it occurs. This is like preparing a flow-chart in reverse. Mark the sequences that you think will convert without much problem and note any in which AtomBasic will allow you to program more efficiently.

Now make a list of every variable used, its type (integer, string or floating point) and what it is used for. Against each one, allocate a similar type of Atom variable. This is where you may need to do some lateral thinking. Since most Basics allow the use of long variable names and recognise at least the

```
  0 REM Cubes
  5 REM (C) Acornsoft 1982
 20 MODE 1
 30 VDU5
 40 VDU19,2,4;0;
 50 REPEAT
 60 FORY%-0 TO 1200 STEP 10
 70 H%=1100-RND(Y%)
 80 PROCCUBE(RND(1300)-50, H%,
    (1200-H%)/6, RND(4)-1)
 90 NEXT
100 VDU19,RND(3),RND(7);0;
110 UNTIL FALSE
120 DEFPROCCUBE(X%,Y%,S%,C%)
130 D%=S%/3: E%=S%+D%
140 VDU29,X%;Y%;
150 GCOL0,C%
160 MOVE0,0: MOVE0,S%:
    PLOT85,D%,E%
170 MOVE0,0: PLOT85,E%,E%
180 MOVE0,0: PLOT85,E%,D%
190 MOVE0,0: PLOT85,S%,0
200 GCOL0,C%+3
210 DRAW S%,S%: DRAW0,S%:
    DRAW 0,0: DRAW S%,0
220 MOVE0,S%
230 DRAW D%,E%: DRAW E%,E%
240 DRAW E%,D%: DRAW S%,0
250 MOVE S%,S%: DRAW E%,E%
260 ENDPROC
```

Listing 1. 'Perspective' series of overlapping cubes drawn from top to bottom of screen by a BBC Basic program from 'Creative Graphics on the BBC Micro'

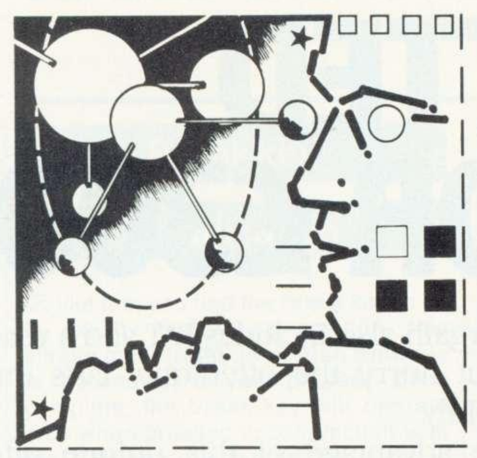
first two characters as significant, you will often find that more than Atom's 27 variables are needed. You can always use arrays and, for tables, byte and string indirection may be a better solution.

Next, look at the routines again and see if any are incompatible with the Atom (eg, SOUND effects) or not essential to the program. Delete these – you can always add something later, if memory allows.

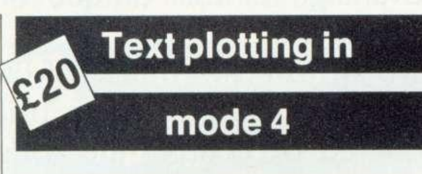
Now you are ready to begin. Convert each routine separately and test the conversion before proceeding to the next one. Do the easy ones first. Successfully converting three-quarters of a program gives you the incentive to tackle the remainder, rather than getting bogged down at the beginning by attempting the difficult bits.

Listing 1 is a BBC Basic program, again taken from the Acornsoft book

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Barry Pickles this month pays good money for mode 4 text, a break key mod, a line deleter and a disc utility to recover lost data



Text plotting in mode 4

HAVING said recently how complicated it was to write in text 4, along comes our old friend Jeff Carter (now living in Ponderosa territory) to prove me wrong. It's not exactly Helvetica – *Acorn User*'s typeface – but it works, and earns Jeff £20. Over to you, pardner:

After reading the Atom Forum's article on Mode 4 text (November issue), I thought I'd send you the system I have used, which is much less memory-intensive than the methods presented, requires no assembly language and permits the size of the characters to be varied. Its drawbacks are that it's somewhat slow and the characters look rather strange (especially K, Q, V and X).

The routine is given in listing 1. It plots one character at the current graphics position and resets the graphics position to five pixels to the right of the character.

The L vector contains one byte for each digit and two bytes for each upper-case letter. The seven least-significant (rightmost) bits of each byte are used to control whether the segments of a seven-segment 'display' are on or off:

```
              2
Current     1 | 4 | 3        Resulting
graphics →   •|---|    •  ← graphics
position    5 | 6 | 7        position
```

The zero (least-significant) bit controls segment 1, and the sixth bit controls segment 7. A one means the segment will be plotted; a zero, the segment will not be plotted. Digits are plotted as one seven-segment 'display', letters as two 'displays' with two common segments. Figure 1 shows the character set that I've defined.

The factor of five given in the plot statements is the length of one segment and produces fairly large characters. Digits are 6 x 11 pixels and letters are 11 x 11 pixels. This factor can be any value in the range 2 to 95. Any smaller and garbage will be plotted; any larger and the characters will be too tall for the display (and only partially plotted).

I got the idea of using the bits of a byte to control a seven-segment 'display' from a biorhythm program published in an Atom user group newsletter. I designed this character set and wrote the routine to select the controlling byte(s) from a character's ASCII code.

The routine is not limited to mode 4. It will work in any graphics mode, including colour modes. The size and shape of the characters will differ from mode to mode if the plot statements are not altered.

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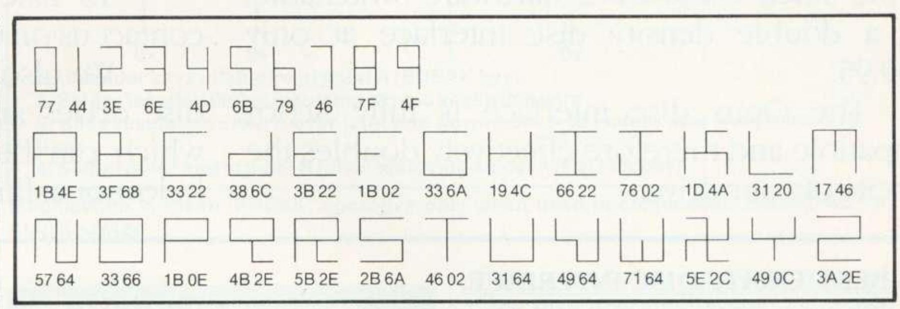


Figure 1. The character set

```
   5 REM MODE 4 CHARACTERS
  10 DIM L(63), A(10)
  20 !L    = #6E3F4477; L!4  = #46796B4D
  30 L!8   = #4E1B4F7F; L!12 = #2233683F
  40 L!16  = #223B6C38; L!20 = #6A33021B
  50 L!24  = #22664C19; L!28 = #4A1D0276
  60 L!32  = #46172031; L!36 = #66336457
  70 L!40  = #2E480F1B; L!44 = #6A2B2E5B
  80 L!48  = #64310246; L!52 = #64716449
  90 L!56  = #0C492C5E; L!60 = #2E3A
  99 REM DEMONSTRATION ROUTINE
 100 $A = "ATOM"
 110 CLEAR 4; MOVE 10, 95
 120 FOR I = 0 TO LEN(A) - 1
 130    C = A?I; GOSUB c
 140 NEXT I
 150 LINK #FFE3; PRINT $12
 160 END
 999 REM CHARACTER PLOTTING ROUTINE
1000cIF C = 32; PLOT 0, 10, 10; RETURN
1010 IF C < 48; RETURN
1020 C = C - 48; IF C < 10; GOSUB e; PLOT 0, 5, 0; RETURN
1030 C = C - 17; IF C < 0 OR C > 25; RETURN
1040 C = 2 * C + 10; GOSUB d; PLOT 0, 5, 0; RETURN
1099 REM UPPERCASE LETTER.PLOTTING ROUTINE
1100dD = C; GOSUB e
1110 C = D + 1; GOSUB e; RETURN
1199 REM ONE SEVEN-SEGMENT "DISPLAY" PLOTTING ROUTINE
1200eC = L?C; PLOT (C&1), 0, 5
1210 C = C/2; PLOT (C&1), 5, 0
1220 C = C/2; PLOT (C&1), 0, -5
1230 C = C/2; PLOT (C&1), -5, 0
1240 C = C/2; PLOT (C&1), 0, -5
1250 C = C/2; PLOT (C&1), 5, 0
1260 C = C/2; PLOT (C&1), 0, 5
1270 RETURN
```

Listing 1. Mode 4 characters

Invented a routine or discovered a hardware modification for the Atom? Here's a chance to show your originality and win some cash. Send your idea to: Atom Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2 9JH.

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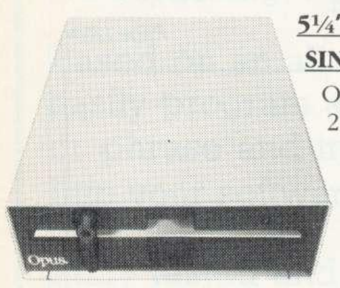
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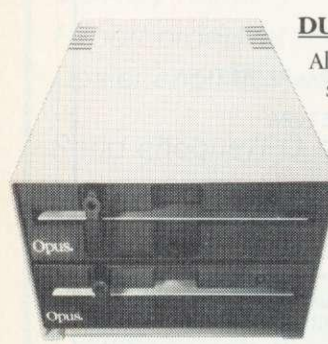
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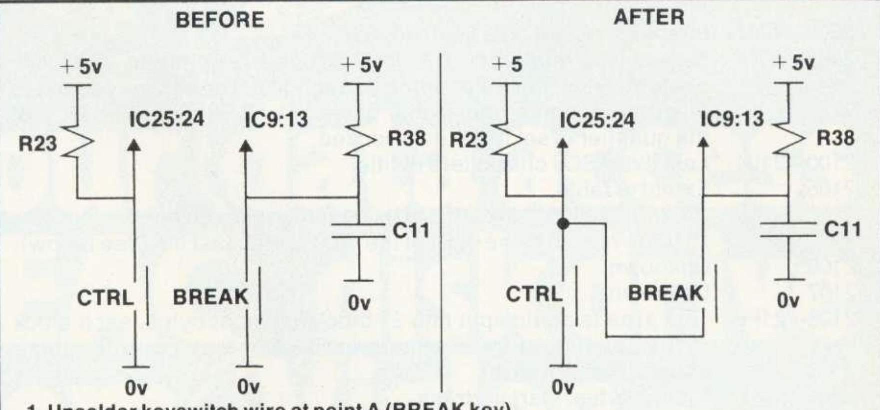
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£10 Break key modification

IF, like me, you find the break key to be in exactly the wrong position, this simple mod. (right) from Alan Knowles is the answer to your prayers. Once complete, the break key will operate only when pressed in conjunction with the CTRL key. It wins Alan £10.



Modification to make 'BREAK' operative only when used in conjunction with 'CTRL', by Alan Knowles

£5 Fast deletion of program lines

A FIVER goes to Colin Hollyman of Fareham, Hants, for his time-saving line-remover utility. He writes:

The *Atomdel* program in December's *Acorn User* certainly is a useful utility. It is usually faster to get the computer to delete unwanted lines and it is less likely to lead to errors. But how many programmers will take the time and trouble to find the right tape, find the place on the tape and load the program, just for the sake of deleting a few lines?

I have a simple routine which can be used to remove any number of lines, provided they are at the end of the program, and temporary lines – eg, aids to debugging or data for testing – can usually be written as a subroutine at the end of the main program.

Suppose all lines after 1000 (included) are to be deleted. Change line 1000 by entering

1000@ (RETURN)

The new line should contain no spaces and any character (other than a number) can be used.

Set a pointer to the start of the current text space

A = #2900

Then increment A until it finds the line

DO A = A + LENA + 3;UNTIL $A = "@"

using the character entered in the first line to be deleted. Set the 'end of program' pointer

?(A-2) = 255

and then reset TOP by

END

On listing, all lines with a line number 1000 and greater will have been deleted.

All this, except the change to line 1000, can be abbreviated and entered directly as one line:

A = #2900;DOA = A + LENA + 3;U.$A = "@";?(A-2) = 255;E.

£20 Utility to recover lost data

DAVID LAKE of Newbury hopes his disc utility will be as useful to readers as it has been to him. It earns him our £20 accolade. Let David explain:

I would be surprised if any owner of an Atom disc system can say that he has never lost a valuable program by accidentally corrupting a floppy. This may occur if a floppy is left in the drive on power-up, for example, or upon interruption of the power supply during a disc write operation. Another maddening cause of lost data is failure to type a space as a qualifier after the *SET command. The short program in listing 2 is a disc utility designed to help recover that lost data.

The most usual cause of a corrupted floppy is an error in the first sector, which is where the catalogue is stored. If the disc operating system is unable to read the catalogue, it doesn't know where the programs are situated on the floppy, so it gives up with one of those 'DISC ERROR XX' messages. The listing enables you to read any of the valid sectors on the floppy into memory, from where the programs can easily be reconstituted, especially if you use one of the commercial toolkit ROMs.

An alternative, which often proves easier, is to store your own dummy catalogue on to track 0, sector 0. This may allow the DOS to read the floppy in the normal way, and once it has been established what the real filenames are, the catalogue can be reformed correctly and stored back on the floppy. This method naturally requires a detailed knowledge of the format of the catalogue, and this is given in table 1 overleaf.

For the adventurous, table 2 gives some of the more useful DOS routines

```
5P.$12
6DIMR10,Q10
7IN."READ OR WRITE"$R
8IF$R="WRITE";GOTO 10
9$R="READ"
10P.''$R''
15IN."TRACK"A;IFA>39 G.15
17?#80=A
20IN."SECTOR"A;IF A>9 G.20
25?#81=A
30IN."BLOCKS"A;IF A+?#81>10;G.30
32?#82=A
35$Q="?#84=#"
40IN."START PAGE"$Q+6;IFLENQ>8;G.40
50?#83=255;EXEC$Q;?#84=?#84-1
110DIM LL5
112LL2=#8200
113P.$21
115FORX=0TO1
117P=#8200
120[JSR #E77A
130BNE  LL1
140JSR #E75B
150JSR LL2;]
160IF$R="WRITE";[:LL0 JSR #E796;]
161IF$R="READ";[:LL0 JSR #E792;]
162[LDA #83;STA #F6
163LDA #84;STA #F7;]
170IF$R="READ";[LDA @#53;]
172IF$R="WRITE";[LDA @#4B;]
180[JSR #E7ED
190JSR #E7A4
200BNE LL0
210:LL1 RTS
220:LL2  LDA #80
230STA #EC
240LDA #81
250STA #ED
260LDA #82
270STA #F1
280JMP #E709
420]
430N.
435P.$6;P=#8200;LINKP
440END
```

Listing 2. David Lake's data recovery utility

#2000-#2007	First eight ASCII characters of title.
#2008-#20FF	Names and qualifiers of files. This area is split into 31 blocks of eight bytes, corresponding to each file. The first seven bytes give the filename, the eighth gives the ASCII qualifier. Bit 7 of the qualifier is set if the file is locked.
#2100-#2104	Last five ASCII characters of title.
#2105	Extent of table. #2000 + ?#2105 is the start of the last filename in the catalogue. #2100 + ?#2105 is the start of the data for the last file (see below).
#2106	Unknown.
#2107	Unknown.
#2108-#21FF	This area is again split into 31 blocks of eight bytes, each block corresponding to the filename in the same place in the table above. The format is: 1st 2 bytes, start address 2nd 2 bytes, execution address 3rd 2 bytes, length 4th 2 bytes, start sector.

Table 1. Catalogue format

#E000	Reset FDC and initialise its parameters.
#E016	Print the message following the subroutine call (terminated with a negative byte).
#E231	Load catalogue buffer (*DIR).
#E237	Load catalogue, decode and display.
#E3E5	New command line interpreter.
#E6FF	Load vectors and prepare to access first two sectors on disc (catalogue).
#E729	Read result register of FDC.
#E75B	Load head.
#E792	Boot block of code for read or write to #00F2-#00FC.
#E7A4	Act on result of operation.
#E7D2	Send command in acc to FDC.
#E7E4	Wait for end of operation.
#E809	Send parameter in acc to FDC.
#E84F	Read data bootstrap code.
#E85A	Write data bootstrap code.
#E87B	NMI service routine.
#EEE2	Setup vectors.

Table 2. DOS routines

which access the INTEL 8271 floppy disc controller. This device is memory-mapped to #0A00-#0A04, and data is transferred under non-maskable interrupt. The floppies are formatted into 40 tracks of 10 sectors, each containing 256 bytes. Listing 2 could be adapted for use in other programs, to make best use of the storage space on the floppy. In particular, the Forth system could be modified to access sectors individually, giving up to 200 screens per floppy, instead of the meagre 31 in the standard system.

#CD	*SET qualifier
#AC	*USE qualifier
#EE	Drive number & status flags
#EC	track number
#ED	sector number
#F1	#20 + number of sectors to read
#F0	number of attempts to read/write before giving up
#F6-#F7	address of start of data

Table 3. Page zero locations

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Creative Graphics on the BBC Micro. Breaking it down, line 20 sets up a hi-res screen, line 50 starts an outer loop (which is never jumped out of) and line 60 begins the main loop. Line 70 sets up H% to a constantly reducing value – the reason for this will become clear later. Line 80 calls the cube drawing routine, passing over values for X%, Y%, S% and C%. Line 90 terminates the main loop and line 100 effectively re-runs the program. The cube drawing routine follows, and line 130 calculates the position of the rear cube face, while line 140 sets the cursor origin to X%, Y%. Line 150 selects the drawing colour for the front face, which is then drawn by doing two filled triangles. Line 200 changes the colour palette again, before finishing off by drawing the rear face and the connecting lines.

This program draws a series of progressively larger cubes from the back (top) of the screen to the front (bottom). Hidden line removal is taken care of by 'pasting over' new cubes on top.

Now for the variables. H% constantly reduces in value, ensuring that later drawings start lower down the screen. S% uses H% in inverse proportion, to give a cube size (edge) which is constantly increasing. E% and D% use S% to calculate the position of the rear cube face (so that all the cubes are drawn from the same viewpoint) and X% and Y% determine where the cube's screen position is. The remaining variable, C%, determines the colour of the cube face.

Listing 2 shows the resulting program after conversion to AtomBasic. This is of course in black-and-white, so line 40 of the original program has been ignored, and the REPEAT . . . UNTIL loop has been changed to a straight re-run. Variable signs have been preserved, with the exception of X%, which now becomes P.

Since plotting filled triangles involves a lot of coding, I have changed the cube drawing routine (subroutine c) so that it draws a filled square. There is no colour, but lines 150 and 160 determine whether to draw in white or black, thus achieving the 'pasting over' effect. Apart from the addition of some variables for intermediate calculation, the only other change is the calculation in lines 50–70 for the parameters to pass over to the subroutine.

I hope that this short series has shown Atom users that they have a passport to the pages of *Acorn User* that lie outside the Atom section. I cannot go into every aspect of other Basics, but practice makes perfect, so try your hand at conversion and open up new horizons on your programming.

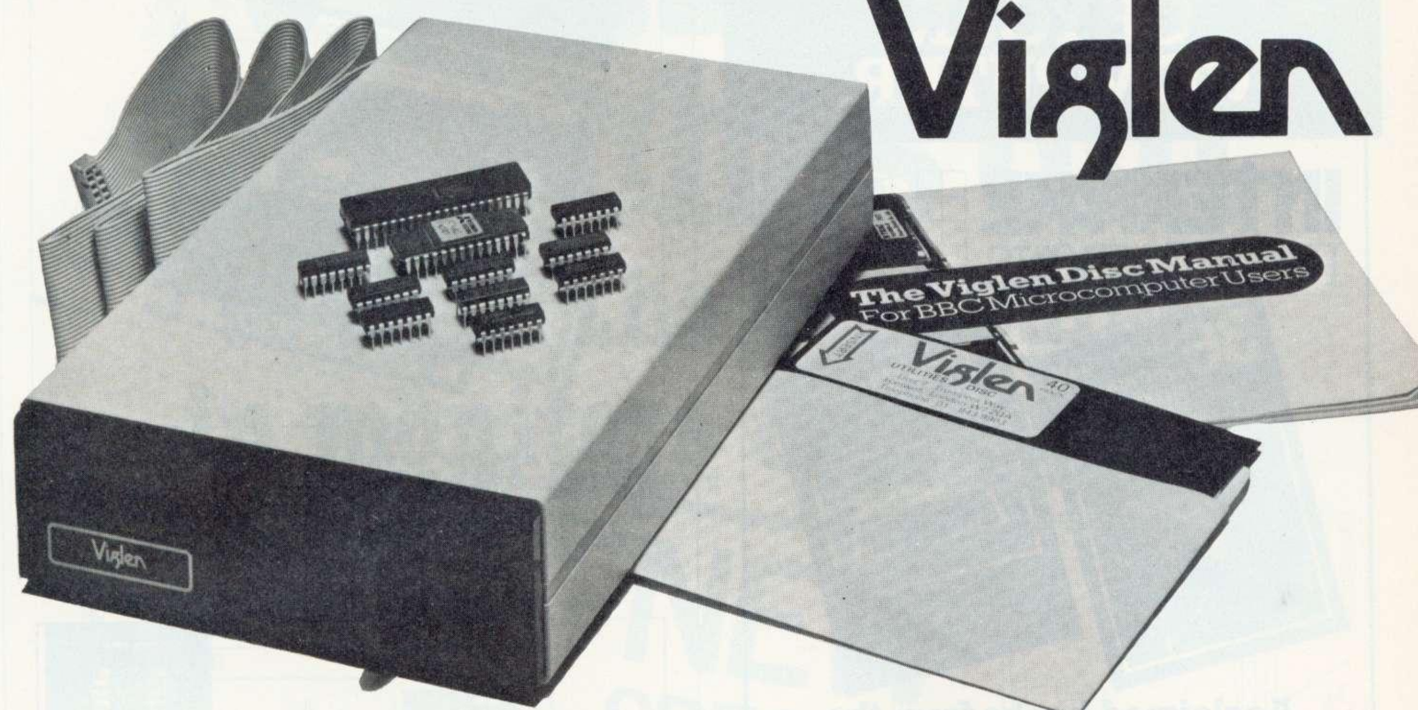
```
  5REM:    Cubes
  6REM: TRANSLATED BY
  7REM:  B. PICKLES
 10CLEAR4
 20F.Y=1TO192 S.4
 30 O=Y
 40 H=190-A.R.%(Y)
 50 Z=A.R.%255;Y=H
 60 S=(190-H)/4
 70 C=A.R.%2;GOS.c
 80 Y=O
 90N.
100LI.£FFE3;RUN
120cD=S/3;E=S+Z
130F=D+Z;G=E+D
140Q=Y-S
150IFC=0 M=7;G.b
160M=5
170bF.P=Z TO G
180 MOVE P,Y
190 PLOT M,P,Q
200 Y=Y+(P/F)
210 Q=Q+(P/E)
220N.
230MOVE G,Y
240PLOT6,E,(Y-D)
250PLOT6,Z,(Y-D)
260PLOT6,Z,(Q-D)
270MOVE E,(Y-D)
280PLOT6,E,(Q-D)
290IFM=5 R.
300MOVE Z,(Q-D)
310PLOT6,E,(Q-D)
320PLOT6,G,Q
330PLOT6,G,Y
340PLOT6,F,Y
350PLOT6,Z,(Y-D)
360R.
```

Listing 2. The cubes program converted to AtomBasic



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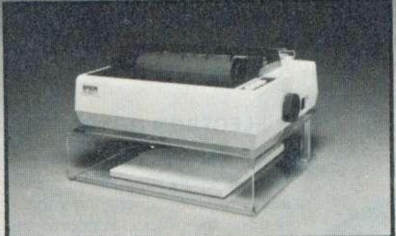
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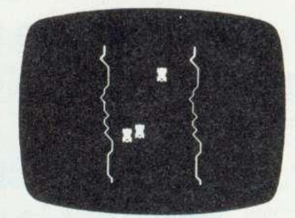
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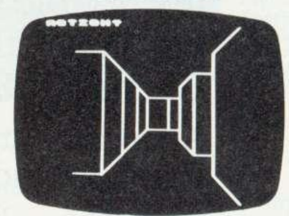
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THE ADE UPGRADE

System's assembler/debugger/editor ROM wins praise from Vincent Fojut

The ADE package can be obtained from System Software, 12 Collegiate Crescent, Sheffield S10 2BA, priced at £60 (incl VAT). An enhanced version of the SPY debugger, SPY2, is available separately, at £24.15.

THE ADE ROM from System Software is a sophisticated suite of programs guaranteed to whet the appetite of any assembly language programmer. The heart of the package is a new macro-assembler, complete with library facilities. This takes ASCII source files, prepared on the comprehensive editor, and generates a file of object code, or executable machine code, which can be run and tested under the debugger. These three primary functions give the package its name – Assembler, Debugger and Editor, or ADE for short.

The system comprises a 16k ROM, a utility disc (table 1) and sizable manual. Once the ADE ROM is activated (on power-up or by typing *ADE), the extra commands listed in table 2 are at your disposal. The three major modules are initialised by typing *ASM, *ED/*EDIT or *SPY, which invoke the assembler, editor or debugger respectively.

The remaining sundry commands are mostly intended to assist the debugging process. The *BRK command forces the SPY debugger 'front panel' to be entered whenever a 6502 BRK instruction is encountered. This facility is deactivated with *NOBRK. Similarly, typing *CTRLF allows the SPY monitor to be invoked by pressing the CTRL and F keys whenever a program is awaiting user input (disabled by *NOCTRLF). Yet another way of entering the SPY utility is by using the *FX100 command (or its machine code equivalent) from within a user program, or ADE command level.

The *LST command calls up a 6502 disassembler, which is in fact part of the SPY utility but can be used independently. Finally, *MODE works in the same way as the MODE command in Basic. It is included to allow an 80-column mode to be selected before an assembly. Otherwise, in a 40-column mode, the assembly listing is truncated at column 39.

To show how the elements of the system inter-relate, figure 1 (overleaf) represents a typical sequence in the development of an assembly language program. First, the editor creates (or modifies) an assembly language text file (it can also be used for the preparation of documentation to accompany the program, or indeed, any general word-processing functions). Assuming, for the moment, that an assembler text file has been generated, this then becomes the source, or input file, for the assembler module.

T.LIBRARY	macro librarian (source code)
LIBRARY	macro librarian (object code)
T.SYSLIB	source code for common macros
SYSLIB	library of common macros
T.DEMO	demonstration program (source code)
D	demonstration program (object code)
T.FMT	text formatter (source code)
T.ADV	source code used in demonstration
AD	object code run in demonstration

Table 1. ADE utility disc files

The assembler, in turn, converts the source code into machine code and generates an output file of object code which can be directly executed. An optional assembler listing can also be produced on screen or printer at this stage. If errors are present, the edit and assemble phases are repeated until a 'clean' or error-free assembly is obtained. However, a lack of errors at this stage signifies only that the source code is recognised as valid by the assembler; it does not, of course, mean that there are no logic errors in your assembler program. Hence the need for a final testing and debugging phase, using the SPY monitor, to help track down and eradicate any outstanding bugs. If any bugs are present the process is repeated from the start – editing, re-assembly, and re-testing – until a bug-free, fully-tested program emerges.

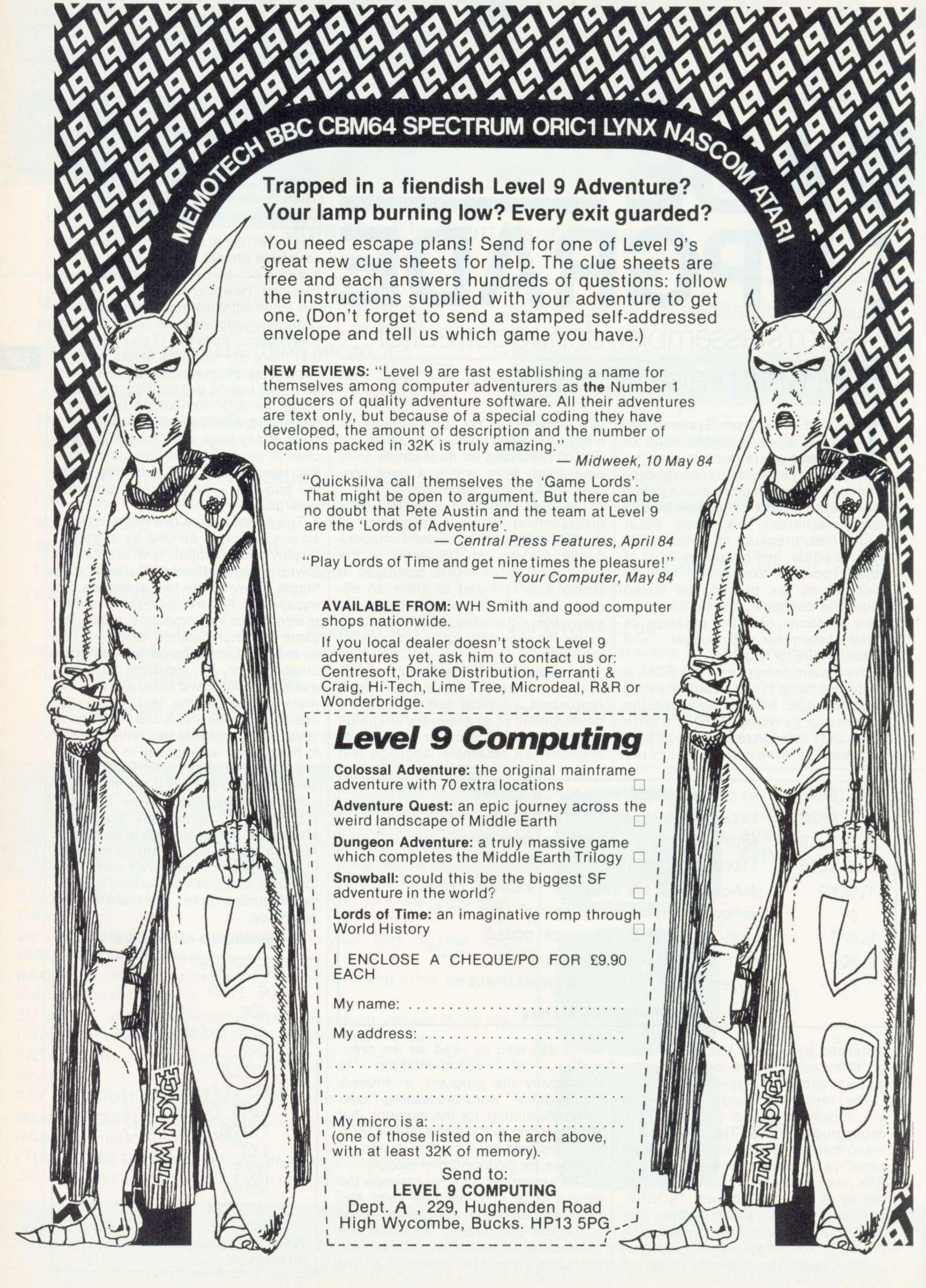
The editor makes use of the mode 7 screen, which is divided by a 'status' display into an upper 'text' area and a lower 'command' area. The user may toggle between the two areas via the escape key. While entering text, in what is referred to as 'immediate' mode, the same text-manipulation functions can be achieved either by control-key combinations or by function key. For example, both f6 and ctrl-O allow you to mark a point in the text. I took the manual's advice and found the function keys to be simpler to use (only one key to hold down, as opposed to two), and the function key strip provided eliminates constant referrals to the manual.

Alternatively, text can be modified via 'deferred' commands which are entered in the command area. Deferred commands can be strung together in blocks, up to eight levels deep, any (or all) of which can be iterated a specified number of times. For instance, the sequence:

5<FSmith/e/=XJohnson/e/>/e//e/

```
*HELP ADE
ADE 1.00
  ADE
  ASM <sfsp> <ofsp>
  BRK
  CTRLF
  ED (<fsp>)
  EDIT (<fsp>)
  FX100,<lo>,<hi>
  LST
  MODE <n>
  NOBRK
  NOCTRLF
  SPY
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Table 2. ADE command level – extra OS functions


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Tab	-ASCII/hex display toggle	<HEX>	-update memory at pointer
L	-disassembly/hex display toggle	"	-enter characters into memory
M	-set up memory pointer	P	-fill & test area of memory
Return	-increment pointer by 1	S	-shift area of memory
+ or	-increment pointer by 8	V	-verify (compare) 2 memory areas
/	-decrement pointer by 1	.	-move to next register
-	-decrement pointer by 8	<HEX>.	-modify register
U	-set pointer to value of PC	Z	-single-step
@	-set PC to value of pointer	J	-jump to address and run program
I	-set pointer from memory (indirect)	K	-continue program execution from PC
R	-set pointer from memory (relative)	*	-O.S. command prefix
G	-find byte pattern	*LST	-activate disassembler
N	-find next occurrence of byte pattern		

Table 3. SPY debugger commands

(where /e/ represents one depression of the escape key) would change five occurrences of 'Smith to 'Johnson'. Using the escape key as a string terminator (as well as command terminator) seems odd at first, but there are advantages. For one thing, it means that search and replace strings can contain the 'return' character within them. In other words, you can find and/or replace blocks of text which span more than one physical line.

Even more versatile is the ability to set up command sequences as 'macro' commands, which can be executed either in command mode or in immediate mode, by pressing the COPY key at any point within the text.

A text formatting program is included on the utility disc to give the editor word-processing capability. Indeed, the manual (a fine piece of documentation) was prepared using ADE's editor.

The BBC micro is already equipped with a very capable assembler, complete with conditional assembly and macro facilities, so how does the ADE assembler compare?

Since the source file is generated and saved separately by the editor and is never wholly resident in memory the only limit on assembler file sizes is that of the discs being used. If a tape system is in use, the object code is written to memory, as opposed to an output file directly, so in this case there is a limit on file size. The format of each line in an ADE assembler program is:

<label> <opcode> <operand> <comment>

Each element on the line can be separated by spaces, or a tab character, which is expanded by the listing routine. This allows neat, formatted output without using up valuable memory. The label, if entered, can be of unlimited length, but only the first six characters are significant. For obvious reasons, try to limit your labels to six characters or less. This is the only point where I could fault the ADE assembler in comparison with the BBC version, but even then, the six-character restriction results in more acceptable assembler listings.

All labels are translated by the assembler into upper-case. I was very pleased not to have to keep changing cases when entering mnemonics and symbols, which can be an irritation on the Beeb. The only reserved word in the assembler is the single letter A, for the accumulator addressing mode, so any other sequence of alphabetic characters is a valid label – even "mnemonics" such as LDA or STX can be used as labels (though they are not recommended).

Entries in the opcode field can be either a standard 6502 instruction mnemonic, an assembler directive, or the name of a predefined macro (a labelled sequence of commonly used instructions). A library of macros can be set up using the PUT command, and retrieved from the library file at assembly time with the GET statement.

Operands, if required, consist of an expression built up from symbols, arithmetic operators and constants. The following prefixes allow constants to be expressed in a number of forms:

no prefix – the default – a decimal number
$ or & – a hexadecimal number
% – a binary number
' – an ASCII character value

A wide selection of data definition directives are also available.

Comments are separated from the rest of the line by either a ';' or '\'. Alternatively, an asterisk in column 1 denotes the whole line as a comment.

Conditional assembly in ADE is achieved by embedding code within IF ... ELSE ... FI (ie, ENDIF) directives. These can be nested up to eight levels deep. An additional command, QUERY, allows the values of labels to be changed from the keyboard during assembly to set the appropriate conditions required.

For all its assembly language powers, the unenhanced BBC micro has deficiencies when it comes to machine-code testing. The SPY debugger goes a long way towards correcting any shortcomings. The 'front panel' of the SPY utility gives a display of all internal 6502 registers and flags, together with a program/data area memory block and details of the hardware stack contents (a nice touch).

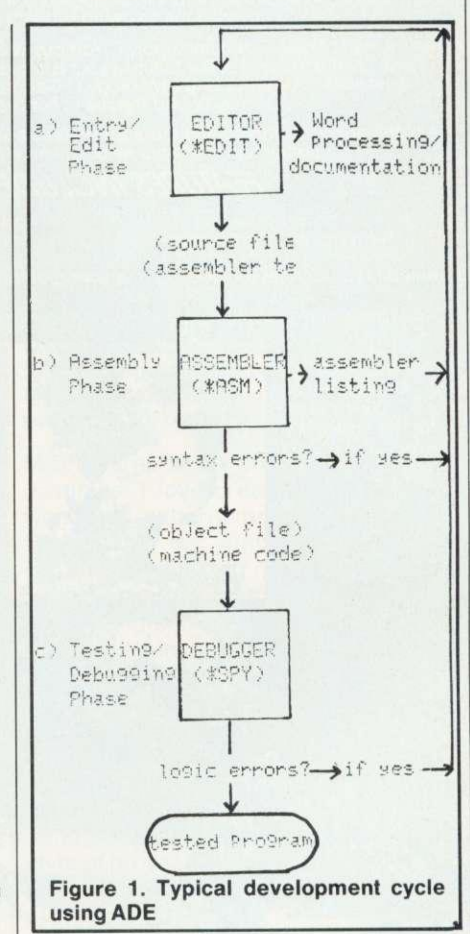


Figure 1. Typical development cycle using ADE

Breakpoint handling is rather basic, but with the ability to stop programs using *FX100 or ctrl-F the result is a versatile package. I found the single-step feature particularly useful. There is the typical selection of commands to step forwards and backwards through memory, alter memory contents and registers, find specific byte patterns, and so forth. A brief summary of SPY commands is given in table 3.

Of course, the cost of ADE (and its range of facilities) shows that it is not aimed at the occasional dabbler in machine code. But when you consider that you are getting an enhanced assembler, capable debugger and an editor which doubles as a perfectly acceptable word-processor, £60 is not a high price to pay. Any programmer who does a substantial amount of assembly language work should give it serious consideration.

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*DEFLIST	Lists all defined procedure and function names.
*FIX	Repairs a 'Bad Program' and then 'OLDs' it.
*FSAVE	Saves files to tape 1·5 times faster than normal, which later can be loaded with ***FLOAD**.
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*TAPEDISC	Takes a specified number of files from tape and puts them on to disc, preserving file attributes.
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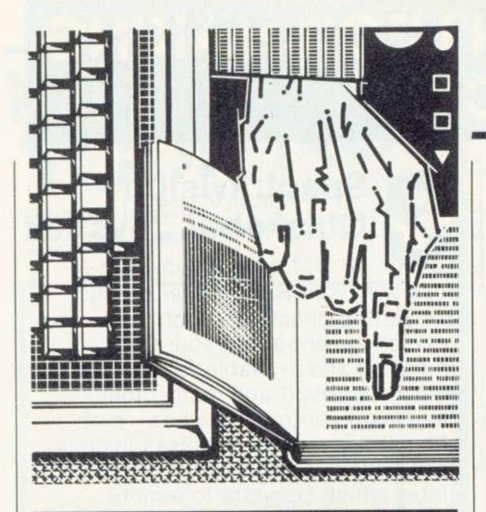
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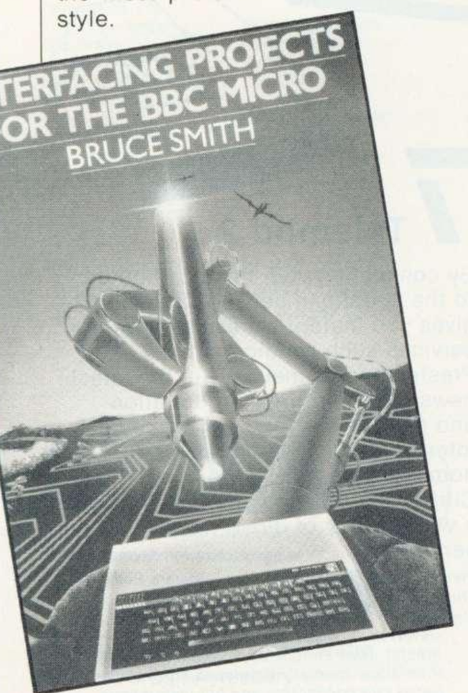




JOBS FOR YOUR BEEB OR ATOM

'Interfacing Projects for the BBC Micro' by Bruce Smith, Addison-Wesley Publishing, 134 pages, £6.95

AMONG the multitude of computer books that you can find on almost any bookseller's shelves, you will find few relating to the subject of interfacing a machine to the world outside. In the headlong rush to become a computer literate society, we are in danger of overlooking this aspect of computing, and yet it is one that we encounter every day, and the one that is having the most profound effect on our lifestyle.



As it happens, the design of the BBC Micro – and, indeed, the Atom – is particularly suited to real time control and data capture and this slim volume will start you along the road to a new horizon.

Written by Bruce Smith, it begins by introducing you to the arithmetic and electrical concepts behind the various user ports and shows you how to read and write to them. Chapter 3 is devoted to the VIA port and gives a detailed description of the lines and controls available on the 6522, which is used for control in all the book's projects. Chapter 4 shows you how to use the indirect addressing that Acorn prefers you to use (to make things compatible with the Tube) and chapter 5 details the physical connection points before describing the construction of a multiple output power distribution board.

The rest of the book puts theory into practice by describing projects for you to build. These comprise: an automatic light switch; a door bell and rain detector (presumably in case you live in a house without windows!); a temperature monitor; sound detector; joystick controller; light pen; D/A converter; light sequencer (disco lights); EPROM programmer; and finally, and best of all, an X-Y plotter. The saving on this last item alone is well worth the price of the book.

All the projects are described in simple, easy-to-understand language and would be suitable for anyone with experience of wielding a soldering iron. All the projects in the book are available in kit form from Watford Electronics. Do not be misled by the title. Most of the projects are suitable for the Atom as well (I understand that many were developed on the Atom) and the translation of the control programs is an easy matter.

So here is a book different from the norm, simply and clearly written. It is recommended for any Beeb or Atom owner who wants really useful applications for his machine. **Barry Pickles**

GAMES WITHOUT THE FRILLS

'36 Challenging Games for the BBC Micro' by Tim D Rogers and Chris Callender, Interface Publications, 270 pages, £5.95

YOU can't really expect arcade quality from a games book costing £5.95, and you certainly don't get it here. The 36 programs in this new collection from Interface are all reasonably well-written, with good use of the Beeb's features (colour, sound and user-definable graphics) but the end results are, frankly, not very exciting.

Fortunately the programs are not too long, so you don't have to spend an age before you learn how good (or bad) they are. While it is not purely a book of listings, the notes accompanying each program are sketchy to say the least, with only the briefest outline of major processes. All the same, the programs are straightforward and not terribly difficult to follow. Meaningful variable names are not generally used, the justification being that resident integer variables enabled the programs to run as quickly as possible.

The book would, perhaps, be of use to those wishing to pick up the rudimentary techniques of writing games programs in BBC Basic. The basics are there, and those with the time and inclination could, with effort, add the frills that the games need. Perhaps this is the 'challenge' to which the book's title refers.

Verdict: pretty mediocre, but at 17p a program . . . **Vincent Fojut**

GRAPHICS FOR MATHS DUFFERS

'Microcomputer Graphics' by Roy E Myers, Addison-Wesley Publishing, 282 pages, £9.95

MICRO graphics is one of my favourite pastimes. I love creating strange and wonderful patterns on the screen. Unfortunately, my maths suffers from years of neglect, so my efforts tend to be a hit and miss affair. I was, therefore, delighted to see this volume, which explains the theory behind such things as translation, rotation and hidden-line removal.

Originally published in the US, it is written in the American idea of a 'user-friendly' style. For example, chapter 6 begins 'Warning – read slowly. Mathematics ahead'! If you can live with this style of prose, the book will impart useful information, illustrated with dozens of example programs.

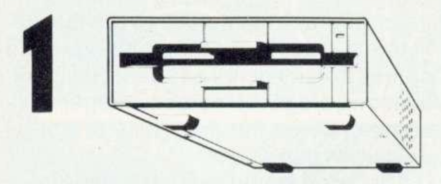
There is a considerable amount of maths to digest, but it was put simply enough for my ageing brain to comprehend.

All the programs are written for the Apple II, but the graphics commands are explained and easy to translate to Atom or Beeb Basic. In fact, the programs are almost directly translatable to both machines, since the standard Apple hi-res mode is a 280 x 192 matrix. All aspects of graphics are covered in the book's 282 pages.

The bible for graphics programmers is *Fundamentals of Interactive Computer Graphics* by Foley and Van Dam (also published by Addison-Wesley), but, as well as being quite expensive, it is written in Pascal and requires a higher degree of mathematical aptitude. This book is in Basic and starts at a much simpler level and I would recommend it to anyone interested in graphics. **Barry Pickles**

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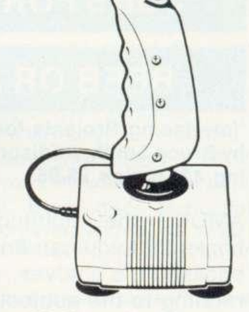
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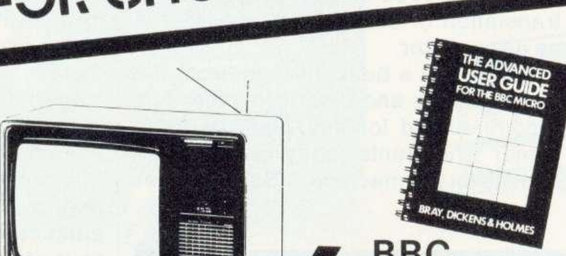
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HANDBOOK FOR DISC USER

'The BBC Microcomputer Disc Companion' by Tony Latham, Prentice-Hall International, 186 pages, £7.95

FEW peripherals enhance the BBC micro as much as discs, and despite the price, an increasing number of Beeb owners are taking the plunge. However, sources are many and varied, as is the level of accompanying documentation. So a book that purports to give a comprehensive guide to using discs with the Beeb is more than welcome.

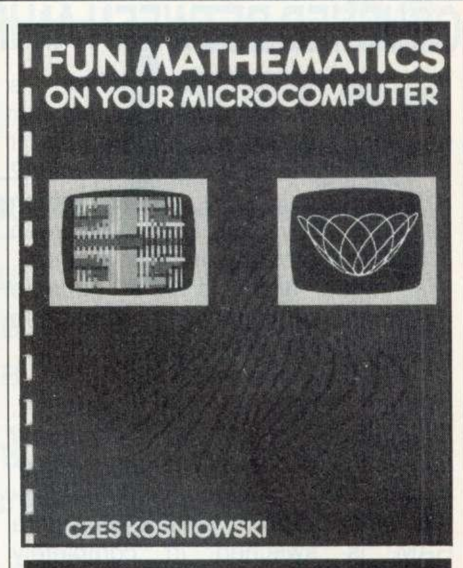
The book starts with an introduction to disc handling and gives a resumé of the standard Acorn DFS commands. It then goes on to file handling (both in Basic and assembler) and covers file-related Operating System routines (OSFIND, OSARGS, etc). Later chapters provide complete program listings for a number of useful disc functions, from formatting and verifying routines to a simple text-handler or word-processing program. To round off, the author gives technical details and performance characteristics of the popular disc variants available.

Much of the material will already be familiar to prospective readers, being available in some form or other in various documents. For example, those already using discs will presumably already have a list of the commands available with their DFS. Similarly, most users will almost certainly have a formatter/verifier at their disposal. On the other hand, there is something to be said for having all disc-related information, even if duplicated, present in a single volume. Even existing disc owners may find useful information in the chapters covering file handling and random access, for example.

As for the provision of format/verifier routines, the author argues that disc drives originally intended for other (older) computers could be put to use with the Beeb, providing discs can be formatted appropriately – hence the programs. For this reason, the book could prove particularly attractive to schools and other establishments with limited resources eager to make the most of existing equipment.

Disc Companion may be beneficial to those considering acquiring discs. The well-rounded overview of disc usage with the BBC micro should help clarify any outstanding areas of confusion, and provide useful guidelines for making the right purchase.

Vincent Fojut



DOESN'T ADD UP

'Fun Mathematics on your Micro-Computer' by Czes Kosniowski, Cambridge University Press, 195 pages, £4.95

THIS book aims to cover some areas of mathematics, illustrating the subject by the use of entertaining computer programs. The choice of topic is broad, covering school mathematics and areas not taught outside universities.

Having read the contents page, I was very disappointed by the rest of the book. It gives an impression of having been written down in one go and never checked. Time after time the author fails to explain terms before he uses them, and sometimes doesn't explain them at all.

The subject-matter is, however, interesting and this book could have a role in computer clubs where experienced help is at hand. It might particularly interest the A-level mathematician who wants to broaden his mathematical knowledge.

Like many things in the world of personal computers this book claims to be more than it is. It does not *teach* mathematics, but merely *describes* parts of the subject. Never before have I seen someone claim to teach differential calculus in two pages.

Neither is it, as it claims, a book for the computer novice. The programs are not simple, and are complicated by Czes Kosniowski's approach to the computer author's bogeyman, portable Basic. He has tried to write programs (using his ACT Sirius 1) that are easily adapted for many different personal computers. The result is programs that will please no-one: verbose and unstructured in the extreme, and using a very small subset of Basic.

I cannot recommend this book.

Jeremy Bennett

The Aries File

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"this is an impressive piece of equipment in its own right and deserves to be taken seriously"
- Acorn User, April 1984

"the trouble with a paged RAM system is that the software has to be aware that it is there. The Aries RAM board gets round this limitation brilliantly"
- The Micro User, June 1984

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SOFTWARE CHART

TITLE	PUBLISHER	PRICE	MICRO
1 (1) Snooker	Visions	£8.95	B/E
2 (11) Twin Kingdom Valley	Bug-Byte	£9.50	B
3 (3) White Knight 11	BBC Soft	£10.00	B
4 (2) 747 Flight Simulator	Doctor Soft	£8.95 (£11.95)	B
5 (19) Hopper	Acornsoft	£9.95	B/E
6 (5) The Hobbit	Melbourne House	£14.95	B
7 (14) Chuckie Egg	A&F Software	£7.90	B/E
8 (16) Hunchback	Superior	£7.95 (£11.95)	B
9 (13) Fortress	Pace	£8.95	B
10 (18) 737 Flight Simulator	Salamander	£9.95	B/E
11 (—) Ghouls	Program Power	£7.95	B
12 (8) Killer Gorilla	Program Power	£7.95	B/E
13 (10) Zalaga	Aardvark	£6.90	B
14 (9) Gorph	Doctor Soft	£8.95	B
15 (4) Snapper	Acornsoft	£9.95	B/E
16 (17) Dare Devil Dennis	Visions	£8.95	B
17 (—) Lords of Time	Level 9	£9.90	B
18 (—) Cylon Attack	A&F Software	£7.90	B/E
19 (—) Dodgy Dealer	O I Consultants	£6.50	B
20 (6) Transistor's Revenge	Softspot	£7.95	B

B = BBC E = Electron Prices in brackets are for disc version

BUBBLING UNDER

Hulk (Adventure International)
Empire (Shards)
Jet Power Jack (Program Power)
Pengwyn (Postern)
Battle Tanks (Superior)
Aviator (Acornsoft)

Compiled by RAM/Computer

NO NEW Top Ten entries in this tasting of the vidiot universe – the nearest is the pitter-patter of tiny Ghouls at number 11. The chart seems to have settled down, with several favourites keeping their position for at least three months.

Among these are *Snooker* – one of Visions' releases from last year – *Snapper, 747, Twin Kingdom, Hobbit, Chuckie Egg, White Knight, Zalaga,* and the not-so tiny feet of *Killer Gorilla*.

It's quite amazing to think that in this, our second birthday issue, *Snapper* is still going strong. It made its appearance, along with Acornsoft's *Defender* and *Monsters*, in the first-ever issue of *Acorn User*.

Another in the adventure style has appeared, *Lords of Time* from Level 9, a publisher that certainly appears to be keeping up its quality. Then *The Hulk* is bubbling – undoubtedly the result of large orders from the multiple stores, as we haven't seen a copy yet.

SOFT OPTIONS

OPTIMA Software's latest release for the Beeb, *Bedbugs*, certainly comes up to scratch. This original arcade game has already had some mothers up in arms as jam sandwiches come to the aid of the game's bedbug-ridden hero.

Castaway is a new adventure game from **Simonsoft**, set in mode 7 graphics. Irate gardeners, beanstalks and priggish chemistry teachers are among the problems you'll encounter on the 'Three Island Adventure' as you go in search of priceless treasure.

A sealed envelope is provided for defeatists which offers them hints.

Computer Assisted Table Bingo is **Resource Facilities**' way of making the learning of multiplications from 1*1 to 10*10 enjoyable for children (or adults!). Calls are made for a 'line' or 'house' when a player obtains three or nine correct numbers respectively. Tel: (0422) 65935.

Integrated Accounting is business software for the Beeb from **Diamondsoft**. The software is supplied on 40-track disc and comes with a comprehensive user manual. Features include areas such as purchase ledger, sales ledger, nominal ledger, cash book and VAT analysis. Tel: (061) 485 8705.

One-Disc Home Office from **Doctor Soft** provides the first integrated program for the Beeb to offer word processing, an address database and spreadsheet linked together on a single disc. The disc is supplied with a 12-page manual. Tel: (0903) 206076.

The microdisc invasion gathers pace as **Beebugsoft** breaks into the new 3½in market with six titles. If your spelling is really bad then *Spellcheck*, for use with Computer Concepts' Wordwise will be of interest. It takes a Wordwise file and searches through it for spelling mistakes, highlighting any it encounters so that you can then edit. Rent-a-ghost becomes reality with the *Sprite Utilities* package, and the other titles are *Masterfile, Teletext Pack, Paintbox* and *Design*.

RIDING HIGH WITH DENIS

'Daredevil Denis', Visions, BBC B and Electron, £7.95

COMPUTER game writers have fertile imaginations. It never ceases to amaze me how a similar concept in a game can be presented in so many different ways. Take *Daredevil Denis*, for example. It represents a novel approach to getting from one end of a screen to another while jumping over or ducking under various objects en-route – a *Killer Gorilla* type of game, but with some original effects.

The object is to manipulate Denis, a stuntman, around three scenarios. These are land, where Denis rides a motorcycle; sea, where he controls a wetbike (a James Bond contraption); and snow, in which Denis dons his skis. The screen display consists of four evenly spaced horizontal lines, representing the landscape, and Denis rides (or skis) along the landscape from the top line to the bottom.

Denis' progress can be controlled from three keys: space bar to jump, Shift to accelerate, and Return to stop. There are six skill levels, ranging from Novice through Oscar Nominee to Ace, within each of which there are six intermediate stages.



Among the original effects is the 'Denis the Stuntman' theme, which holds it all together. This is carried through even to the high score table, which shows your achievement in terms of wages earned. Each new life (there are three) is announced with the slam of a clapperboard closing (this is a film set, after all) and a new 'take'.

But there are irritating things about the software. Although the sprites are well defined, and there are 30 of them, the screen has an empty look. The graphics can be unpredictable when there is a crash and this can detract from the realism of the game. On the plus side, however, the break key is disabled, including control/break. The sound effects are good, especially those when Denis is on skis. The graphics are smooth during a jump, and a crash is fun to watch at first as Denis is thrown from his vehicle and lands upside-down flailing his legs.

Daredevil Denis seems to have been written with a sprite-making package, yet despite its well-defined characters the screen display is a disappointment. Nevertheless, I found the game quite challenging and the higher skill levels proved difficult. A pity the screen isn't more fully utilised.

Dee Vince

BRIDGE WITH A FEW GAPS

'Contract Bridge', Alligata Software, BBC B, £9.95

THIS piece of software will give great pleasure to keen bridge players although it has limitations. Load it and you can get excellent practice at bidding and playing hands with infinite variation. It plays near standard if a little conservative Acol-type bidding with pre-emptive jump bids, strong two and Stayman convention.

You play south except when north is declarer, so half the hands are yours to play. You are offered the hand and previous bids, and a prompt asks you to call. You can see the last trick, faintly visible on the screen. Once contract is reached you play normally, the tricks being counted for you. At the end of each trick all the hands are revealed and you can analyse the bidding and play at leisure before going on with the exercise.

Contract Bridge provides very good entertainment and my impression is that the proportion of hands with unusual distribution is above what would be expected, although that tends to add interest.

There are limitations to the program that are not obvious from the description on the box, and it is as well to be aware of them in advance. There's no scoring or provision for doubles, and each hand stands alone, so bids such as the take out double which might be conditioned by such situations are not supported. Nor is there a means of declaring, so you must play every hand out to the bitter end, and the absence of a slam convention makes the frequent long, strong suits hard to make the best of in bidding. More annoying was the fact that the machine plays a little too fast for me, especially when any of the hands, including declarers, is without a choice. Finally, there's a bug in the program that I was unable to trace which gives 'No room at line 6650' about once an hour, apparently at random.

These are small complaints about a good idea which will give pleasure to the many bridge-playing model B owners and the game is entertaining and useful at a reasonable price. A much more sophisticated version is apparently coming.

Roger Carus

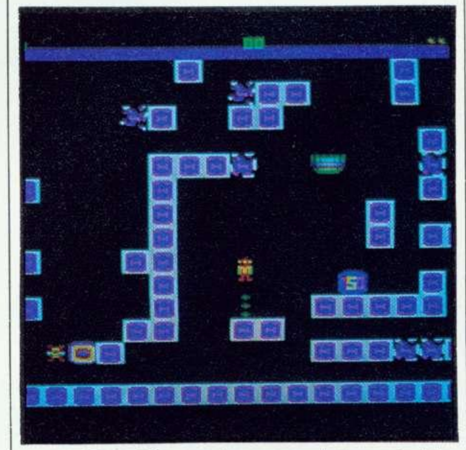
HOLOCAUST IN THE HOLD

'Demolator', Visions, BBC B, £6.95

THE Demolators are ghost-type nasties whose sole aim is to destroy the human cargo held in cryogenic suspension aboard the Battle Star *Quinn* (Visions denies that it is named after *AU*'s illustrious editor!) as it transports the last remnants of Homo sapiens across the galaxy. Patrolling the cargo bay is the Phobe, the ultimate robot, and you have to manoeuvre it around (with keyboard or joystick), picking off the aliens. The Demolators have the advantage, though, of being able to move through any objects they encounter, whereas the Phobe must dodge these obstacles, at the same time taking care not to blow itself to bits on any of the mines lying around.

Points are scored by zapping the Demolators with the inevitable ultrasonic cannon.

The Demolators have their allies, too. The Minor is a real beast. He appears randomly and if you don't zap him he mutates into a deadly mine which cannot be destroyed and eventually the Phobe can be hemmed in. The Protector is a bit like a mobile Minor that fires back (not very nice), while the Tracktor actually homes in on you.



Demolator is well-presented, making good use of sound and colour. The graphics are very good, and excellent, flicker-free use of sideways scrolling gives a good impression of travelling down a long cargo hold.

The game gets more difficult as you progress and it apparently has 24

stages – I couldn't get past stage 4 after about an hour's practice. The game is complete when you have used up your available lives, of which you have three.

The verdict: slightly above average, with good graphics. **Bruce Smith**

WIREFRAME ENEMY

'3-D Tank Zone', Dynabyte Software, BBC (32k), £8.95

THIS offering from Dynabyte follows Acornsoft's *Aviator* as an innovative piece of software that makes use of the Beeb's fast processing speed at machine level to produce three dimensional wire-frame graphics. For the uninitiated wire-frame means that the object, in this case a tank, is displayed simply as a 3D outline figure, with little or no detail. This doesn't mean the effect is unrealistic. On the contrary, it stimulates the imagination and I prefer it to minuscule overdetailed characters.

Once *3D Tank Zone* is loaded you find yourself at the controls of a tank looking out onto a landscape containing a multitude of pyramids (or are they hills?). The turret may be rotated to face one of the other three points of the compass to show missile silos, part of a city and what look like volcanoes erupting in the distance.

The on-board radar, which is rather disappointing, shows a single point to represent the position of an attacking enemy tank, located visually by swinging the turret around. By using the keyboard or a joystick the sights of the anti-tank missile launcher are aligned and the deterrent launched. This process is harder than you might expect. The sights are not the cross-wire type but move up and down the side of the screen and across the top of the screen, so it takes some skill to line them up. The marauder is also manoeuvring smoothly at an often unpredictable speed so he's easy to miss. Once launched, the missile whistles away and if you're on target the enemy tank is obliterated – and another appears on the radar screen.

In the skies waves of lifelike jets and helicopters are on the attack. You can shoot them down using the on-board anti-aircraft cannon, the sights for this being the standard cross-wire type. Only one weapon can be fired at a time.

Points are awarded for destroying any enemy hardware, tanks carrying the greatest value. The object of the game is to destroy as much of the enemy before he pops your clogs, so an eye needs to be kept on the condition of the energy banks.

As with many of the programs marketed today, little information about the program is provided on the card insert. I wish software houses would at least print the key/joystick functions so that they may be readily referred to. It's annoying to have to reload the program to note them down.

Really, *3D Tank Zone* follows the old familiar pattern – zap-zap, bang-bang – which is disappointing. However, the graphics are its main selling point and they work exceptionally well, not up to the *Aviator* standard but an honourable second. **Bruce Smith**

GALLONS OF TROUBLE

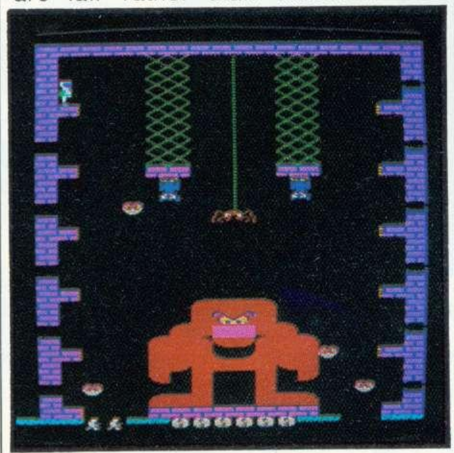
'Jet-Power Jack', Micro Power, BBC B, £7.95

JET-POWER Jack, the inter-galactic hitch-hiker, has been kidnapped. His captor is no less a character than Nogrob the Terrible, who runs the Botch system.

Jack is held in a garage and must recover vital fuel pods to refuel the waiting starships. As usual, his oxygen supply is limited, so he has to be quick. The garage is filled with obstacles, but luckily Jack has a turbo-booster on his back (the Jet-Power) so he can move from level to level. In doing so, he must avoid the live light fittings in the ceiling and the edges of the platforms.

There are five sections, each with five fuel pods. The stages become progressively harder, until Jack meets Wilfred the hideous Yugg monster on section five!

The sounds used are simple but effective, and may be switched off at the start of each new game. The graphics are fair rather than excellent. The



movement can be less than smooth, but this fault is not serious. Colour has been used well and some of the monsters look really mean!

Controlling Jack is easy, using only three keys. 'Control' and 'A' govern horizontal movement, while 'Return' fires the rockets on Jack's power pack.

You can begin a new game at any level, a good idea for all games. If you get tired of playing, Escape takes you back to the top-ten scoreboard.

Jet-Power Jack is great fun, addictive, quite frustrating at times and, best of all, good value for money.

Stuart Menges

YOUR SEARCH THROUGH TIME

'Lords of Time', Level 9, BBC (32k), £9.90

LEVEL 9 – arguably the producer of the best adventure games in the UK – has done it again. *Lords of Time* is a sparkling addition to its stable of winners, with more than 200 beautifully described locations and a repertoire of witty ripostes to even the dumbest instruction.

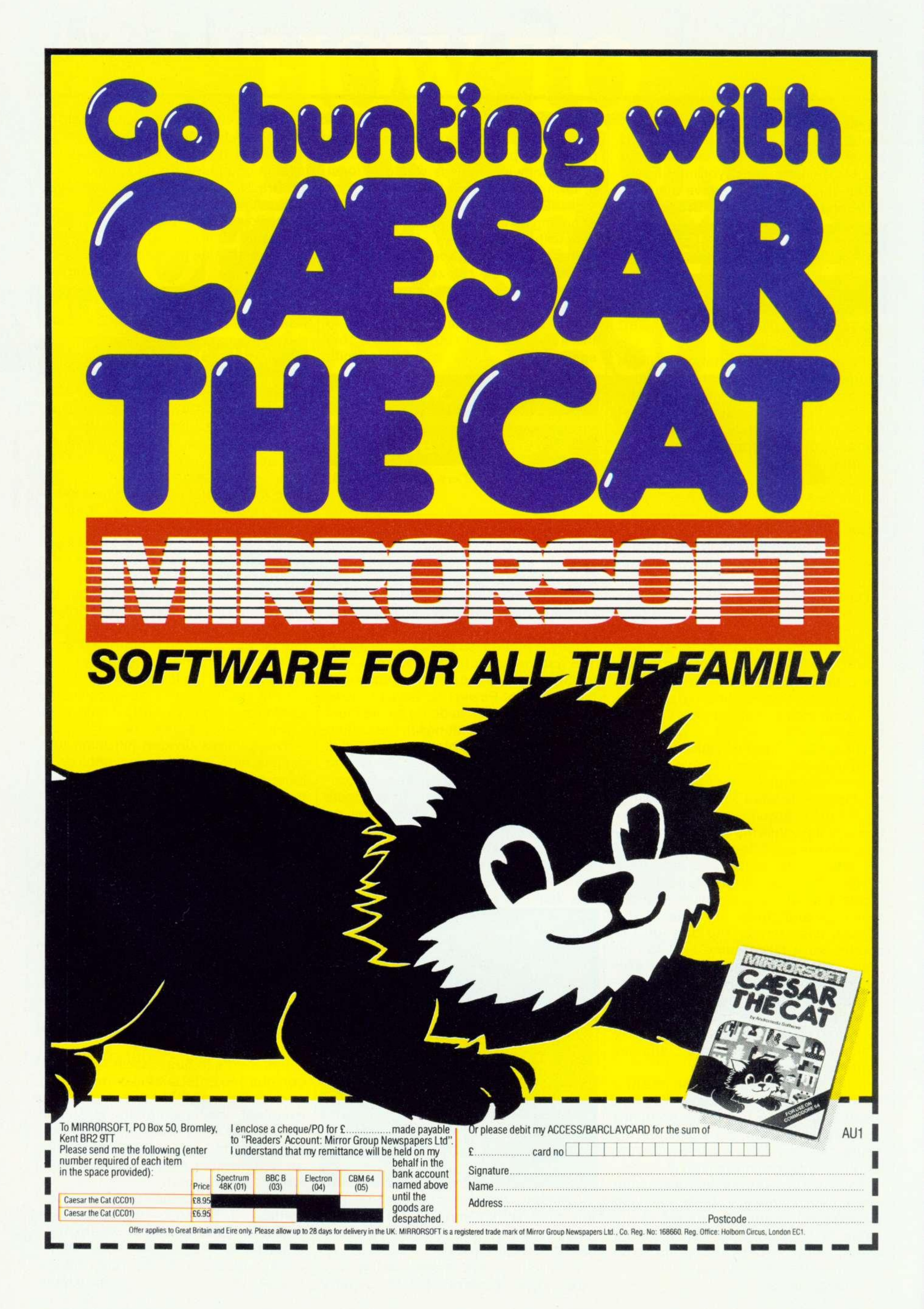
The game's theme involves nine evil Timelords who have meddled with Earth's history so that they can rule eternally. Father Time recruits the player (that's you) to travel through time and put an end to their dastardly deeds by collecting nine 'symbolic objects' which, he assures you, can repair history. On the way there are, of course, plenty of valuable knick-knacks to be picked up, ensuring a comfortable retirement for the weary time-traveller.

The game is divided into nine time zones – nine separate adventures in different periods of the Earth's past and future – interlinked in that objects found in one zone are needed to solve puzzles in another.

There are some useful additional features – for instance, longer phrases can be entered, such as 'Give drink to bartender'. This makes the game more realistic and gets away from the endless repetition of 'Take' and 'Drop'. Also, if you want to know more about an object before you pick it up, you can examine it and get a more detailed description. This might range from the cryptic (Examine candle – 'wax') to the helpful (Examine suit of armour – 'Just your size!').

Full marks to Sue Gazzard for an ingenious and entertaining game design, and to Pete and Mike Austin for its excellent implementation. Response time is fast and – most important – you can restart the game without re-loading an initialisation data file (other game writers please note).

Oh well, back to the keyboard – yes, I confess, I haven't actually cracked *Lords of Time* yet! Now where did I leave the Galactic Groat? Was it on the ice-age glacier or in the Tudor hedge-maze? **Mike Milne**



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IT'S FASTER VIA THE SILICON DRIVE

... says Malcolm Banthorpe

Sideways RAM board (128k), Solidisk Technology, 17 Sweyne Avenue, Southend-on-Sea, Essex SS2 5JJ (0702) 354674, £139.95 (inc VAT)

IN HIS review of the 16k version of Solidisk's sideways RAM system (February issue), Vincent Fojut talked of its exciting potential for expanding the BBC micro, and explained that the board itself could be expanded in two stages to 32k and 128k. This largest version can also be bought as a complete unit which offers significant additional facilities.

Here are my experiences with the 128k version.

As the previous review pointed out, inserting wire terminals into the CPU socket alongside the CPU pins seems a little crude, and for me this proved the most tricky part of the installation. With the 128k board another five connections have to be made to the 6522 VIA and another chip. However, at least the need for permanent modification to the circuit board is eliminated and the system has proved reliable.

Used straightforwardly, the 128k board gives eight paged blocks of RAM, each of 16k, into which can be loaded sideways ROM-type software – or you can assemble your own machine-code routines directly into this area, leaving the main memory free for Basic programs and screen memory.

What really distinguishes the 128k unit is that software is supplied that enables this extra memory to behave as a 'silicon disc'. In this mode, 100k is available. The software loads a modified copy of the DFS into sideways block 8. For this purpose you must have Acorn DFS 0.90 already installed in the machine and it can be assumed that other DFS systems will not be suitable. One 16k block (sideways location 15) is still available for sideways software.

The rest of the sideways RAM now behaves for most purposes as if it were a 100k disc drive – only faster. All the normal DFS commands are recognised and obeyed, the silicon disc appearing as drive 1. If you already have a drive 1, an alternative piece of software can be loaded to make the silicon appear as drive 4.

Three new DFS commands are incorporated into the modified DFS: *FORM40 (or *FORM80) formats 40 and 80 track discs; *VERIFY, according to the instructions, or *VFY in the software as received, verifies either the silicon drive or a conventional floppy; and *DCOPY copies the contents of the disc in drive 0 to drive 1 or vice versa. This last command behaves almost the same *COPY *.* to copy all the files from one disc to another, except that if you try to copy from the silicon drive to an unformatted disc the new disc will automatically be formatted first.

*DCOPY could be the most useful command for owners of a single conventional drive, as it enables backup copies to be made rapidly without the disc swapping normally required when using *BACKUP or *COPY *.* with a single drive. With the Solidisk board installed, one simply *DCOPY's the floppy into the silicon disc in one operation and *DCOPY's everything back onto a new disc in a second single operation.

The average file transfer speed is claimed to be 40k per second – up to 15 times the speed of a floppy. The speed is certainly apparent when loading program and data files, especially as no time is taken for the disc to get up to speed. Table 1 shows how the speed of the Solidisk system compared with my single-density 40-track floppy drive in a number of typical operations.

These timings include the time taken for the floppy to get up to speed and show that, while the speed difference is not always 'up to 15 times' as great, there's always an advantage.

The speed of storing single bytes using BPUT was also compared with the time taken for a Basic program to store 1000 bytes directly to the main memory. Here the time was 0.98 seconds for direct storage – just over half the time taken to store similar information on the Solidisk system. This indicates that, though it is not yet possible to run a Basic program while it is still resident in sideways RAM, a large program could use data files on the Solidisk as an alternative to arrays without much loss of speed.

As well as the silicon disc program, other useful utilities were supplied on disc. Most of them involve the use of machine code routines, but in many instances source code is supplied. Solidisk Technology offers software updates at just £2 for a new disc.

Menu is a useful program to include on any floppy disc to be used alongside the Solidisk system. It displays the contents of all 16 potential sideways ROM/RAM locations, plus the catalogue of the floppy drive and the silicon disc (if the sideways RAM has previously been booted into this role). Any file shown can be loaded with a single keystroke.

Among the other utilities supplied:

Silexicon, three programs which constitute a fast spelling checker for any text file on floppy disc. A 4.5k machine code program plus a dictionary file and a 'tree table' are loaded into the silicon drive. The dictionary initially holds 5000 words and may be extended by the user up to about 15,000 words.

Operation	Floppy disc	Solidisk
*LOAD 12.5k program	2.86 secs	0.24 secs
Open data file and store 1000 6-character strings	19.69	6.01
Open data file and read 1000 6-character strings	19.49	4.78
*LOAD mode 1 screen (20k)	3.24	0.32
Store 1000 bytes using BPUT	4.75	1.66
Read 1000 bytes using BGET	4.11	1.56
Load Wordwise file of 2250 words	29.5	6.8

*BACKUP floppy to Solidisk: 20.8 seconds
*BACKUP Solidisk to floppy: 22.7 seconds

Table 1. How the Solidisk 128k board compares for speed with a 40-track floppy disc drive

Word64, a utility for creating Wordwise files up to 64k in length as opposed to the normal 24k limit. This is achieved by holding only a 16k 'window' to the complete text file in the main memory area, the rest being held on silicon disc.

Buffer appears on the disc but was not documented in the instructions. It turns out to be a print buffer that sends any text to be printed rapidly to the buffer first, releasing the computer for use while the printer is at work.

If you are using a single disc drive then the Solidisk 128k system is worth considering as an alternative to a second drive. Its price compares with that of a single 40-track drive and it offers a number of advantages.

TRIPLE TEST

BUS PRICES

Acorn	£325.00
Cambridge Computer Consultants	£224.25
CST-Procyon	£385.00

Including VAT, mains lead and cable for connection to the micro

Paul Beverley and Nigel Eames try three IEEE488s

THERE are a number of standardised methods of interfacing computers to other devices and one of the more versatile of these is the IEEE488 standard interface bus. Three companies, all based in Cambridge, produce one: Acorn, Cambridge Computer Consultants (now trading as Aries Computers)and CST-Procyon.

The IEEE488 interface bus was originally developed by Hewlett-Packard as a means of communication between 'intelligent' instruments. This first version, called the Hewlett-Packard Interface Bus (HPIB) or the General Purpose Interface Bus (GPIB) was standardised and its specification published in the IEEE488 Standard of 1975, revised in 1978. Up to 15 instruments may be connected to the bus at any one time, one or more of which can control the data transfers between the others. (The IEC625 Standard, another industry standard interface, is identical to the IEEE488 except for the type of connectors used.)

Typical applications include micro-controlled testing stations for testing production instruments or running a complete set of tests on the performance of a particular system (figure 1).

Measurements of quantities such as frequency response, rise time, phase shift and many others can be made automatically and limited only by the facilities available on the 'intelligent' test gear. The computer acts as the controller, issuing instructions over the bus for the transmission and reception of data and for the function control of the instruments – for example, frequency selection, range changing, disabling and enabling of front-panel controls and pen-up/pen-down instructions for plotters. In some circumstances it is necessary to synchronise signal generation and the collection of the resultant data, and this is taken care of by the controller or computer.

The bus has 24 lines – eight for data; eight for control (three for 'handshaking' and five for 'management'); and eight ground lines. The handshake lines are used by the controller and the peripheral devices for controlling the transfer of data over the bus. A device, often called a 'listener', indicates its readiness to receive data by putting a logic 0 on the perversely named Not Ready For Data (NRFD) line, ie, if the line is low (= *Not* high) it *is* ready for data. The sending device, often called the 'talker', places the data on the bus and sets the Data Valid (DAV) line high. The listener signals its collection of the data by setting the Not Data Accepted (NDAC) line low, ie, active low.

The IEEE488 standard bus may be run at data rates of up to 1Mb/sec, which imposes stringent conditions on the lengths and types of cables used. The ground lines form twisted pairs with each of the control lines, minimising interference between these asynchronous lines. The bus is connected in parallel to every instrument in the system either in a linear manner, one after the other, or in radiating star arrangement. The connectors on the cables must, of course, be stackable. Cable lengths are limited to 2m per instrument, or 20m overall, whichever is the shorter.

The interface management lines which are used to control the flow of data and commands over the bus and to reflect its status are as follows:

ATN—When the Attention line is high this is an indication by the controller that data on the bus is to be interpreted as a command and not as data. For example, this may be used to set up a device as a listener or to disable the front panel controls of the instrument.

IFC—Interface Clear. This line, which is active high, is an overall reset control line and all devices capable of responding will do so. It is analogous to the BREAK key on the BBC micro and should be used only upon initialisation of a system. Only the system controller can issue this command.

REN—Some instruments are capable of remote operation via the bus as well as from their front panel. The remote enable REN (active high) line is used to put such instruments into the remote controlled state when they have previously been set up to receive data or commands.

SRQ—Service Request. This is the line, or flag, used by the peripheral devices to request servicing in the event of an error condition or some circumstance beyond its control – eg, input signal out

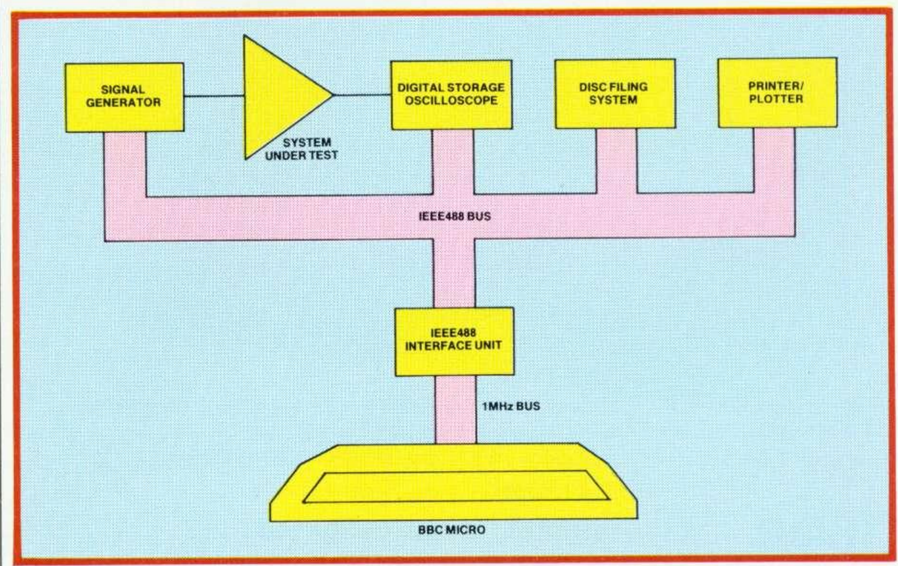


Figure 1. Typical IEEE test rig

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of range, data buffer full or invalid command. It does not affect the current operation on the bus and it is up to the controller to take the necessary action.
EOI—End Or Identify. The data transmitting device (which may or may not be the controller) drives this line high, simultaneously transmitting the last byte of data.

The data is transmitted over the bus as strings of ASCII codes. The strings are sent one byte at a time and 'handshaking' is used for each byte, thereby giving very reliable (and fast) transfer of data. Using ASCII encoded data overcomes the problem of different instruments or systems representing numbers and control codes in different ways. ASCII codes use only seven bits out of the eight in each byte and so in some systems the eighth bit is used for parity checking. It is sometimes necessary to send the full eight bits of each byte and this may be done by transferring each byte separately.

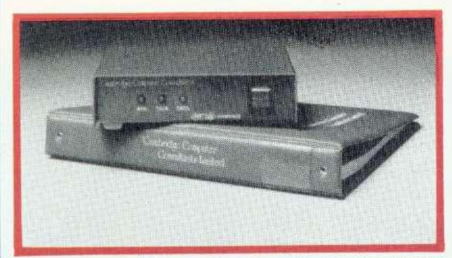
The full complement of functions described by the standard is rarely implemented on any one instrument simply because they are not all needed and so subsets are implemented as required. The standard allows for more than one controller to be connected to the bus and provides facilities for transferring control from one to the other. However some systems, such as Pet and Apple, implement a subset that allows only one controller, and in the case of Pet computers the device addresses are fixed as well.

Each device connected to the bus must have a unique address, which may be in the range 0 to 30. This allows a range of instruments to have their device address preset so that any combination of them may be used on the bus without having to change device addresses every time the combination of instruments is changed. The address is usually preset on each instrument by a switch on the back panel. In some instruments it is preset by the manufacturer and may be altered by changing links on the circuit board; in others it is fixed. Occasionally, it may be set as required through the software.

This address is called the primary address of the device. Secondary addresses are those within a particular instrument that allow the controller to select the required function. A digital multimeter, for example, would have several secondary addresses for the selection of DC, AC, voltage, current, resistance etc.

To make an objective assessment of the systems from Acorn, Cambridge Computer and CST-Procyon the relatively simple task of sending a data array from the computer memory to a printer via the interface was programmed for each of the three units. Data sent was the ASCII encoded listing of the program required to effect the data transfer. Two versions of each program were run, first using data strings and secondly single bytes. The program listings are shown in listings 1 to 6 (yellow pages xi and xii) with comments on those instructions peculiar to each interface. The programs were written at the highest level available, ie, Basic, as this is easiest to read to compare. For high-speed data transfers, lower level routines should be used where provided.

The Acorn unit is externally attractive, being housed in a moulded case that matches the colour and profile of the BBC computer. Connection to the computer is via a ribbon cable terminated with an ID connector for direct connection to the 1MHz bus. The 1MHz bus connector is stackable at the interface end, thus allowing other interfaces or systems access to the 1MHz bus. The unit contains terminating resistors for the 1MHz bus which may be easily unplugged from their sockets if the unit is not the last device to be connected to the computer. The power supply is on the same PCB as the rest of the circuit, except for the mains transformer, and the unit comes with a fitted mains cable with moulded integral 13 amp plug.


The Cambridge Computer Consultants (Aries Computers) unit has three useful LEDs


Software for the CST-Procyon interface is in an EPROM

The software to run the interface is in an EPROM which plugs into one of the vacant ROM sockets inside the BBC computer. The manual has comprehensive instructions for fitting the EPROM and for making the necessary link changes if your machine is pre OS 1.0 (Acorn says it will provide and fit a 1.2 operating system ROM free if you still have the 0.1 operating system ROM).

The computer treats the interface as a filing system and selects it with the *IEEE command. Immediately following the first use of *IEEE you must carry out four instructions. These are: open the command and data channels; set the device address of the computer; and clear the interface. Channels to peripheral devices must be created using the command OPENIN (line 90, listing 1) and set up to LISTEN (line 100) or to TALK before data transfers can take place (line 130). Up to 14 channels can be open at any one time.

If the data is to be transferred byte by byte instead of as a string, the interface must be informed and told the number of bytes to be transmitted (line 110, listing 2). BPUT#<channel>(data byte) is used to output the data rather than the PRINT#<channel>(data string) instruction used otherwise. It is good housekeeping practice to close channels when they are no longer required, as the channels remain open even if a different filing system is selected. Channels are closed using the CLOSE #<channel> instruction or the CLOSE#0 instruction which closes all channels except the command and data channels.

Listings 1 and 2 imply that the Acorn unit requires more programming effort than the other two and this is probably true. However, they also disguise its underlying versatility. It is possible to allow one device to 'talk' to others without involving the computer in data transfer, leaving it free for other tasks. Control may be passed to another controller connected to the bus and requested back again, and the system may be used with any language running on the computer that allows the use of a filing system. The language structure used in the instructions makes it easy for the programmer to keep track of what is going on.

The manual is not for the uninitiated. It's brevity is chilling. However, those familiar with the IEEE interface will probably find most of what they require, the documentation outlining the commands in Basic and the operating system calls that are used by the interface.

Cambridge Computer Consultants' unit comes in a compact metal case with three LEDs on the front panel that indicate the status of the ATN line, whether the interface is addressed to TALK and whether data is being transferred – a useful aid when fault-finding an inoperative system. The back panel has the device socket and six miniature DIL switches, five to set the device address of the interface and one to set the interface as the 'master' controller or the 'slave' controller. Unfortunately, in the Off position the switches actually

touched the side of the slot in the case and were difficult to move back to On.

Again, the unit's power supply is on the same board, except for the mains transformer. The mains connections to the transformer tags were covered with a piece of insulating tape. Connection to the computer is via a ribbon cable terminated with a non-stackable ID connector for direct connection to the 1MHz bus.

The software is supplied on disc or cassette and consists of a library of procedures and functions in Basic that are loaded into memory above the user program. The library line numbers start at 30000 and the library itself occupies just under 1.8k. A well-documented source program describes the purpose of the functions and procedures.

The CCC unit is used by calling procedures to perform the required tasks. Before any data transfers are attempted, the bus must be initialised by calling PROCIEINIT<address>. The argument for this command is the base address of the memory mapped Input/Output, &FC20. To set the interface up as a TALKer the PROCIEWRIT-<LISTENer device address> instruction is used (line 60, listing 3). The device address used here must contain the device primary address and, if there is one, the secondary address. If there is no secondary address '−1' must be inserted instead. Data can then be sent either as an array, in strings or byte by byte (line 70, listing 3 and line 80, listing 4).

If the data is to be sent to more than one listener, each listener must be enabled separately by calling a procedure PROCIELA<listener address>. This is necessary where device events need to be synchronised.

This unit required four instructions, including the housekeeping, to perform the simple program listing task, which compares favourably with the Acorn interface. But for a more complex IEEE488 link-up with several devices connected to the bus the Acorn unit is preferable, with its greater range of instructions available.

The manual gives a good introduction to the IEEE488 standard and describes in some detail most of, but not all, the procedures and functions in the software. The documentation is, however, inadequate for anything other than simple data transfers. The means of implementing such commands as Local Lockout, Selected Device Clear and a few others is not described at all. Irritatingly, the user is referred to the Texas Instruments data sheet for the TMS 9914 IEEE488 controller chip to find the necessary information.

Details of various options are given in the manual, as are other technical details of internal modifications, including details of operation under interrupt.

The CST-Procyon unit is housed in a smart anodised aluminium case with the 1MHz bus and IEEE488 bus connectors on the back panel, which also contains the mains socket. The front panel has three LEDs for Data In, Data Out and Bus Active. The unit has an onboard power supply, the mains transformer also being mounted on the board.

The mains connections to the transformer are close to the edge of the board but are not insulated.

The software for this unit is in an EPROM, which fits into one of the vacant ROM slots on board the computer. The manual gives explicit fitting instructions.



Christopher Turner, head of Acorn's IEEE interface team, demonstrates the cosmetically matching Acorn bus unit

It is obvious from the listings that this unit requires very little programming to output an array of data from memory – just two instructions, in fact. The interface is also treated as a filing system, as was the Acorn interface, and is also called by *IEEE. Using the command *IEEE automatically initialises the interface. Opening and closing of data channels is also automatic and is performed in the execution of the PRINT#<channel number> or INPUT-#<channel number> instructions. Thus only one instruction is required to output the data to the required channel. If a device has a secondary address, or more than one channel is listening you have to add a further instruction; a channel must be opened (with OPENIN) stating the primary and secondary addresses of all devices required.

The documentation for this unit is excellent and complete, covering not only high-level control of the bus in Basic but also in the lower level star commands, which use the IEEE standard mnemonics, and the BBC's operating system calls. Of the three, the CST-Procyon manual was the only one to specify the maximum data transfer rate, quoted as 50k/sec.

All three units have been manufactured to a high standard and are mechanically robust, giving confidence in their long-term reliability.

For simple system configurations – for example, one talker and one listener – the CCC unit is ideal. It is easy to program at this level, does not involve fitting a ROM inside the computer and is relatively inexpensive. The unit is now marketed by the renamed company (Aries Computers) with the model name Aries-B488 and a number of improvements have been incorporated since the model was received for review.

The DIL switches on the back panel have now been removed and replaced by software programmable latches; the initialisation routine now includes the IEEE device address of the interface; the unit allows direct device-to-device communication and the software includes a simple means of placing numerical data that has been received in string format into arrays in the BBC micro.

The Acorn unit has a very full implementation of the standard and is therefore well suited to systems involving several instruments. Programming for multiple devices is no more difficult than it is for a single device.

The CST-Procyon interface has the fullest implementation of the standard, as it is possible to use this unit either as a controller or as a device and to change between the two functions. In controller mode it may be the overall system controller or a slave controller. In device mode it behaves as a device controlled by the current controller, which enables any machine or computer with an IEEE488 interface to control the BBC micro remotely.

Control via the interface is achieved using secondary addresses to give access to the operating system calls of the BBC. Specifically, these are the IEEE filing system, the OSCLI, OSBYTE, OSWORD, OSWRCH and OSRDCH routines.

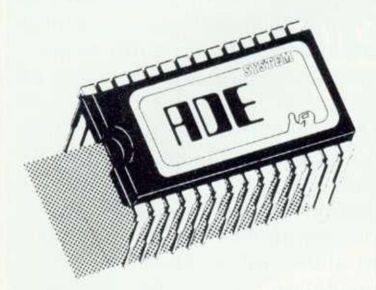
CST-Procyon also offers a CBM filing system ROM to enable the Commodore peripherals to be used with the BBC micro and a set of libraries to support the use of the interface from most of the languages available on the Torch and Acorn Z80 second processors. Also available is an IEEE bus analyser ROM for diagnostic testing of other IEEE hardware.

There is a one-year warranty with guaranteed replacement of a faulty unit by the next working day.

Which one is the best buy? Well, it depends on what application you have in mind, and what facilities you therefore require. It would be fair to say that, with all three units, you get what you pay for.

SYSTEM SOFTWARE

·ROMs FOR THE BBC MICROCOMPUTER·



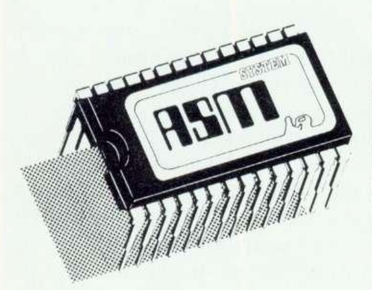
The complete program development package for assembly language programmers. ADE is the de facto industry standard for professional software writers using the BBC microcomputer. The 16k ROM contains a full 6502 MACRO assembler, a dynamic text editor, a front panel debugging monitor and disassembler. ADE comes complete with a 160 page comprehensive reference manual and a utility/macro library disc. ADE can also be used with tape based machines.

The ASSEMBLER features macros with library facilities; nestable conditional assembly; flexible listing options (with or without macro expansion); hex, decimal, binary and ASCII data formats; dummy section; full range of arithmetic and logical operators; symbol table sort and dump; file chaining and 29 powerful pseudo ops. Source and object files are kept on disc so there is no limit on program size or location.

The EDITOR is designed with the programmer in mind for writing both programs and documentation. The editor includes a very powerful command language (including macros) that enables much editing to be done on a semi-automatic basis. It features full screen editing and deferred edit modes; no limit to document size; edit with backup facilities and a versatile text formatter.

The DEBUGGER is instantly accessible for inspecting, modifying and disassembling machine code programs. Features include full 64 byte display in hex, ASCII and disassembled format; registers; stack; single step; breakpoints; memory search and much more.

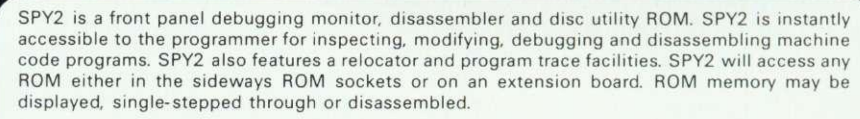
Price £60 inc vat. Please specify 40 or 80T utility disc.



ASM provides all the superb features of the ADE macro assembler on its own ROM.

The program source file may be written using any editor (even Wordwise or View!). Complete with reference manual and utility/macro library disc. Use the assembler that professional software writers use.

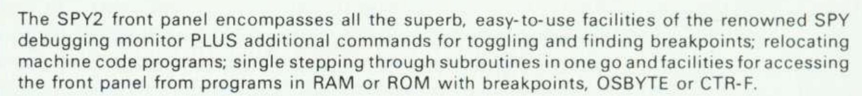
Price £35 inc vat. Please specify 40 or 80T utility disc.



SPY2 is a front panel debugging monitor, disassembler and disc utility ROM. SPY2 is instantly accessible to the programmer for inspecting, modifying, debugging and disassembling machine code programs. SPY2 also features a relocator and program trace facilities. SPY2 will access any ROM either in the sideways ROM sockets or on an extension board. ROM memory may be displayed, single-stepped through or disassembled.

SPY2 includes a set of powerful disc recovery commands for interrogating, editing and retrieving data stored on a floppy disc. SPY2 also includes a disc formatter as well as a non-destructive single track reformatter.

In all SPY2 has a comprehensive set of 23 utility commands. These are supported by an excellent Reference Manual.



The SPY2 front panel encompasses all the superb, easy-to-use facilities of the renowned SPY debugging monitor PLUS additional commands for toggling and finding breakpoints; relocating machine code programs; single stepping through subroutines in one go and facilities for accessing the front panel from programs in RAM or ROM with breakpoints, OSBYTE or CTR-F.

SPY2 features a versatile disassembler with hex dump, full and intelligent disassembly. This identifies data areas in the program; these being displayed as a hex/ASCII dump. Operating system calls are labelled creating very readable code. The powerful trace facilities enable program instructions and register contents to be traced to printer whilst the program is running. Indispensable for graphics programs as they can be stepped through whilst observing the effects on the screen.

SPY2 features a disc sector editor displaying the contents of a whole sector; disc search facilities for finding byte patterns or strings and free disc space. Files may be recovered by creating a directory entry with all the data concerning the deleted file. Directory entries can be easily amended using the *AMEND command. The *FORMAT command formats discs with any number of tracks. A verify command checks discs. The *REFORMAT command is extremely useful for recovering information from a bad track, reformatting it and restoring the data. Commands are included for loading files at &1900 and automatically downloading (and running) them.

The most comprehensive of all debugging/disc utility ROMs.

Price £30 inc vat.



Dept. A 12 Collegiate Crescent, Sheffield S10 2BA



ON-LINE TYPEWRITER

To Barry Pickles: a 5 lb baby Brother

The Brother EP44 personal electronic printer, Jones & Brother, £253 (see price box for further details)

IF YOU have any preconceived notions about printers, prepare to have them shattered. The EP44 is the latest offering from Brother and seems set to have the same impact on the printer market as the ZX81 had on the computer market.

The EP44 is an electronic typewriter. It is portable, weighing only 5lbs, and runs off batteries, although an optional mains adapter is available. It is an 80-column, text-only machine, giving a very high quality print from a 24 x 18 dot matrix head. It prints on plain or thermal paper (if this adaptability puzzles you, printing is done by thermal transfer and on ordinary paper, this is achieved by burning through a carbon film ribbon – ribbon life 40,000 characters).

It has full margin and tab-setting options, variable line spacing and features such as underline, centring, right margin flush and auto carriage-return. It also has a 3.5k text buffer (about three pages of A4) and retains text storage with the power off (it also has auto power-off!). When you need to change batteries, internal ni-cads retain memory for an hour after batteries are removed. There are some editing facilities, such as insert, delete and append text, and a 15-character preview screen to allow immediate correction of any obvious mistakes. The screen can be scrolled in any direction, in the manner of the latest portable computers.

There are three printing modes: direct print, which prints immediately; correction print, where characters are not printed until they disappear from the left of the preview screen; and non-printing, useful for storing text in the buffer.

Oh yes, the EP44 also has a built-in four-function calculator, which can be used in print or non-print modes, it has the ability to print text with the calculation (eg, 2+3=5 acorns), and may be made to calculate a sum but print only the answer. One other mode, line-by-line printing, stores text in the line buffer (capacity 160 bytes) and will not print until either the buffer is full or <CR> is pressed, so the entire line can be edited before this. The text buffer has a 'memory left' function.

Finally, there's a neat STOP key function which, if pressed, will stop printing from the buffer and allow you to type characters from the keyboard which are then printed immediately. Pressing CONT resumes printing from where it left off.

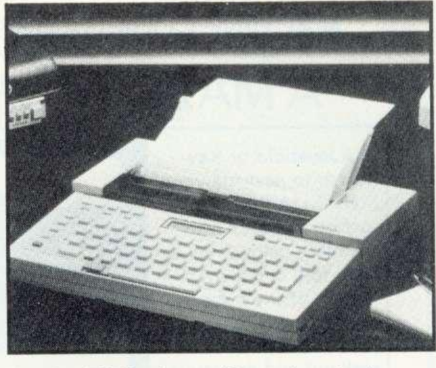
```
Features include: Underlined text  (
                              CENTRING                Right margin flush
01234567890123456789012345678901234567890123456789012345678 90
1234567890
Tabbing:
          *         *         *         *         *         *
This is the UK character set:
 !"£$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[ ] _àbcdefghijklmnopqrstuvwxyz{|}

This is the typewriter code set:
¢°"£$%&'()*+,-./0123456789:; =÷?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[±] _ abcdefghijklmnopqrstuvwxyz¼½ ²

This is the 8-bit data code set:
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[ ] _ abcdefghijklmnopqrstuvwxyz{|}
ÇüéâäàåçêëèÏÎÌÄÅÉæÆôöòûù§ÖÜ¢£¥₧ áíóúñÑaō¿  ½¼!«»ßµøØ±÷°²

                superscript
You can also do             and             quite easily.
                                subscripts
The calculator function can print as normal:
123+456=
or text can be inserted:  123apples+456apricots=579acorns
or just the answer can be printed:   579acorns
```

Print quality of the EP44 is very high, but it is slow at 16cps



Brother EP44 – typewriter as terminal

All quite remarkable for a typewriter, you might think, but what makes this Brother special is a key marked NORMAL/TERMINAL. Switching to TERMINAL mode brings into play the built-in RS232C port, allowing you to use the EP44 as a computer printer. Even better, the port is fully duplex, so you can use the machine as a terminal to another computer, or even, via a modem, to Prestel, BT Gold and the like. In this mode, text can be transferred out of the text buffer, but, sadly, the reverse is not true – reception uses only the line buffer.

The EP44 comes complete with two excellently written manuals, batteries, ribbon and two packs of paper. The detachable lid can store two spare ribbons and it has a clip to stow the port cover. The machine is fussy about the paper you use, preferring lightweight, slightly shiny paper, although I achieved good results with a pack of fanfold paper from Smiths, once I'd removed the perforations (the carriage is 8in). Paper-feed is friction only, but an optional roll-feed adapter is available.

Here, then, is a go-anywhere typewriter/printer/communications device, with just about everything most users could need (except graphics). It is well-designed, well thought out and a joy to use. I can thoroughly recommend it. Incidentally, Atom users, lacking an RS232 port, can use the printer if they have Procyon's Disatom chip fitted, so there's no need for them to feel left out.

PRICES

EP44	**£253.00**
Roll-paper holder	**£5.95**
Ribbon	**£1.75**
Thermal paper pack	**£4·88**
Normal paper pack	**£2.25**
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Normal paper roll	**£2·87**
Soft cover	**£30.00**
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All prices inclusive of VAT

Supplier: Jones & Brother, Shepley Lane, Audenshaw, Manchester (tel: 061-330 6531). Available from W H Smith, Boots and other leading retailers.

PIXELS ON PAPER

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmno
pqrstuvwxyz{|}~

The character set was in normal mode.
The remaining printing is in BOLD mode, which uses more ink, but is necessary
for visibility.

First the 0Oo - Il1 test. These characters are ugly but distinguishable.

Now to demonstrate the colour changes possible.

Underlining too and in colour.

Enlarged in colour  and reversed.

TAB function:
123456789012345678901234567890123456789012345678901234567890123456789
                   ^POS20    ^POS30              ^POS50
```


George Hill finds a perfect colour match for the Beeb

Canon PJ1080A ink-jet colour printer, £433+VAT (review model supplied by Microperipherals)

THE CANON PJ1080A, one of a new generation of moderately priced colour printers, works on the ink-jet principle, which means that anything you can do on the screen you can do on the printer – bar charts, pie charts, colour graphs, screen dumps, coloured text. The real joy of the system is that it uses the same numbers to represent the colours as the Beeb does. This makes possible precise screen printing (I will explain how this is accomplished later).

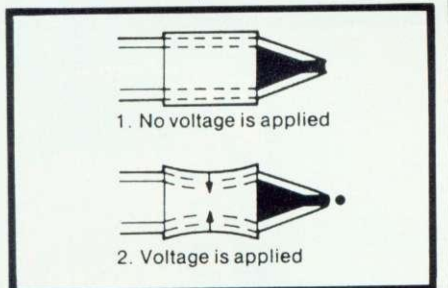


Figure 1.

The PJ1080A (not to be confused with the PW1080A dot matrix printer reviewed last month) uses the ink-jet principle in the 'drop on demand' form. That is to say, small drops of ink are expelled at high speed from the print-head by an electrically induced compression (figure 1). The drops are ejected from four nozzles for the four coloured inks, and the compressions timed to cause the required drop to hit the paper at the right instant.

This form of ink-jet technology produces a lower resolution than the other ink-jet method, involving charged droplets of ink in a directing field, the PJ1080A's being approximately equal to that of a conventional dot matrix printer (560 dots per line, non-overlapping).

To understand how the printer can so closely mimic what is displayed on the screen we need to consider the theories behind producing colour images.

Red, green and blue are the primary colours for transmitted light, and they can be mixed in any proportions to make the other colours – yellow, magenta and cyan. This is the basis on which the RGB television system works.

The situation is exactly reversed, however, when you are mixing coloured pigments, because the colours are now reflecting rather than emitting light. The primary colours here are the complementary colours yellow, magenta and cyan, which can be mixed to make red, green and blue. It follows, therefore, that there's a simple mathematical relationship between the two systems for mixing primary colours to create their complementary colours.

Actually, the Canon has four different coloured inks: yellow, magenta, cyan and black. Although black can be achieved by mixing the other three colours, the availability of black avoids the need to overprint three times – which carries the risk of smudging – and allows the printer to be used in normal printing mode. It also makes it possible to switch between black and white backgrounds, even while colour printing.

There are a few minor problems with this technology – the blue comes out rather purple and the other colours a trifle pale, but the Canon's overall results are startling.

What of the Canon's text? Well, it is barely tolerable. The style is ugly, being based on a 6×8 matrix with no descenders. The g is so bad that the manual mis-prints magenta as mazenta to avoid the embarrassment of showing it off in purple. The most peculiar thing is the O, which is really an upside-down Q. This distinguishes it from the 0 but produces very peculiar-looking text.

The printer can print in bold mode (ie, deeper colours, using two drops of ink instead of one), enlarged mode, and of course in colour. It can print in any colour with any other colour as background and all is under software (ESCape sequence) control. The main features can be preset on easily accessed DIP switches.

Print speed is quoted as 37 characters per second, which boils down to a benchmark (actual printing speed in normal use) of 30.5cps in normal mode and 16.2cps in bold mode if you test it against program 5 (see page xiv). To use the program a stopwatch (not the TIME function on the Beeb) should be set to time the interval between first carriage movement and the appearance of the last character. Speed in characters per second is 2000/time_taken.

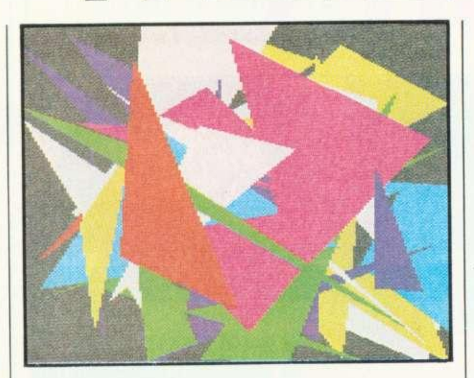
The biggest disadvantage of the PJ1080A is the paper-handling. This Canon will cope only with friction feed paper of a maximum width of 216mm ($8\frac{1}{2}$in), which restricts it to roll paper or A4 sized cut sheets. You can't use fan-fold paper – it's too wide to feed in. Nevertheless, the roll-holding arrangements, as with all the other hardware features, are neat, well thought out and well engineered.

The manual for the PW1080A dot matrix printer was the best I have seen. This one is produced along the same lines, but it is so verbose and repetitious that it is difficult to see the wood for the trees. It is, however, full of programs, all in LPRINT terms.

To summarise its attributes, the PJ1080A colour printer is the greatest thing since sliced bread for graphics, adequate but slow for program listings, but a complete non-starter for word-processing.

A: DUMP IN ITS TRUE COLOURS

See your way clear to accurate dumps with George Hill's routines



IT IS worth trying to mimic the BBC Micro's screen precisely in your printout, instead of being satisfied with a mere reasonable representation. But how do you produce a dump for a genuine colour printer? To do this we must first understand the organisation of BBC colour graphics.

The colour system on the Beeb is remarkably simple. Three bits represent any of the colours from 0 to 7:

Bit 0 (least significant) represents the RED component
Bit 1 represents the GREEN component
Bit 2 (most significant) represents the BLUE component

In binary terms:–

001 colour 1 is RED
010 2 is GREEN
011 3 is red and green mixed, giving YELLOW
100 4 is BLUE
101 5 is blue and red mixed, giving MAGENTA
110 6 is blue and green mixed, giving CYAN
111 7 is red, green and blue mixed, giving WHITE

Add a fourth bit and any of the above colours can be made to flash. This is done by subtracting them from 7 at a regular interval (using the EOR instruction), so colour 5 flashes with 2, 3 with 4 and so on.

How does the computer manage in modes other than mode 2, where only two or four colours are available? The answer is by 'mapping'.

Let's look at mode 1 as an example. The GCOL command can have as its second argument the numbers 0, 1, 2 or 3 for foreground colour. These numbers correspond to the colours black, red, yellow and white. Thus the 'logical' colour is 0, 1, 2 or 3, but the 'physical' colour is 0, 1, 3 or 7. This relationship between logical and physical colour is accomplished by using a 'palette'. Thus when a mode 1 GCOL 0, 2 is encountered the micro consults a table (such as table 1 overleaf) to discover that logical colour 2 is actually physical colour 3, and so it plots yellow rather than green.

A copy of this table is located in normal RAM, at addresses &36F to &37E. It can be read by an OSWORD call, and written to by VDU19, etc, or via OSBYTE (*FX155) or OSWORD.

The use of VDU19 (which *writes* to the palette) is exhaustively covered in various places, including the *User Guide*. Its OSWORD and OSBYTE equivalents offer few advantages and are best avoided by the amateur. The technique by which you can *read* the palette is less well known, but it offers a powerful method of adjusting screen dump programs to read the actual colour physically displayed, as opposed to the logical colour, which is determined by the POINT function and its OSWORD equivalent (called with A% = 9).

The procedure to read the palette is:

1. Read the logical colour using OSWORD with the accumulator set to 9.
2. Use the value found by step 1, and pass it to OSWORD with the accumulator set to 11 (&B). This will read the palette, and puts the physical colour in the next byte, followed by the three trailing zeros used by VDU19 and destined for 'future expansion' – whatever form that may take.

To do it we need to set aside a block of



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Signed ________

Name ________

Address ________

Post to: Micro Olympics offer, Database Publications, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

```
DIM block 8         :REM reserve 9 bytes
block!0=X_coord     :REM insert X
block!2=Y_coord     :REM insert Y
A%=9
X%=block MOD 256
Y%=block DIV 256
CALL &FFF1          :REM OSWORD
A%=11
X%=(block+5) MOD 256
Y%=(block+5) DIV 256
CALL &FFF1
on exit from the procedure
logical_colour=block?5
physical_colour=block?6
```

Listing 1.

```
.point lda #9              \read logical colour
       ldx #block MOD 256
       ldy #block DIV 256
       lda Xlo             \low byte of X_coord
       sta block
       lda Xhi             \high byte of X_coord
       sta block+1
       lda Ylo
       sta block+2
       lda Yhi
       sta block+3
       jsr &FFF1
       lda #11             \read palette
       ldx #(block+5) MOD 256
       ldy #(block+5) DIV 256
       jsr &FFF1
       rts
```

Listing 2.

memory. This can be at an absolute address that you are sure is free (eg, &B00, &C00, &80, etc) or a block reserved by a DIM statement. The latter is the preferred method if you want to incorporate the procedure into a Basic program. The length of the block is nine bytes (five bytes for Osword 9, plus four for the physical colour and three trailing zeros).

First set the X and Y registers (or X% and Y%) to point to this block of memory. The X and Y co-ordinates of the point to be read are placed in the first four bytes of the block. Now set A to 9, CALL OSWORD, and the logical colour is deposited in the fifth byte.

Reset the X and Y registers to point to the fifth byte of the block (where the logical colour is), set A to 11 (&B), and CALL OSWORD again. The physical colour is deposited in the sixth byte of the block, followed by three zeros in the seventh to ninth bytes of the block.

The Basic version would look like listing 1.

Translated into assembly language it looks like listing 2.

On exit the logical colour is in block + 5, and the physical in block + 6.

This is much simplified in actual programs by the use of labels, and the internal calculation of Xlo, Xhi and so on, which do not need re-setting on every entry.

This gives rise to two programs. The first (listing 3, page xiii), a hybrid Basic/assembler program, is a 'universal' pattern dump for all graphics modes, using the ESCape L (double-density graphics) sequence available on many Epson, Star, Canon, Shinwa, Inforunner and Panasonic printers (any others?). It dumps the screen 'sideways' with minimum distortion – though it still suffers from the Epson problem of oval circles. It copes with all colours in all modes and is impervious to VDU19 changes, though it is less than perfect in mode 0 if VDU19 has been used. How it works should be obvious to those who followed the article in the December issue on the universal dump. It is shorter and faster than the December dump (although I don't like the patterns so much) and it overcomes the problems of that dump in normal mode 0 use. Use program 3 as follows.

1. Find the place in the program where you want the dump to occur.
2. If using tape, suppress messages by inserting the line *OPT1,0.
3. Insert the line VDU7:CHAIN"C/EPAT" (VDU7 gives a signal to start the tape – messages have been suppressed!).
4. Run the resulting program.

Listing 4 (pages xiv-xv) deals with the Canon colour graphics system, which is not unlike that of the Olivetti Spark-Jet printer. It requires colour information to be sent in single horizontal lines. You define the number of dots per line that the printer is to expect, using ESCape "X" n, where n is the number of bytes of dots (ie, number of dots/8). You then send three times that number of bytes – one set for RED information, one for GREEN and one for BLUE. There's also an alternative system which repeats each line a specified number of times. This is ESCape "r" n1 n2, where n2 is the same as n in the ESC "X" sequence.

I decided to use the latter technique, and to step the X co-ordinate by 2, thus reading mode 0 pixels once, modes 1 and 4 pixels twice, and mode 4 pixels four times. This combines with the two-dot-line depth per pixel to give a completely distortion-free picture filling the paper. (The meaning of n1 is one of the serious errors in the manual, which states that the line of dots will be printed n1 times, whereas it is actually repeated n1 times – ie, printed n1 + 1 times.)

The dump calculates the physical colour for a point, as described above. On the first pass the least significant bit (LSB), corresponding to the RED information, is rotated into the printer byte, on the second pass the LSB is dumped and bit 1 (GREEN information) is rotated in, and on the third pass the BLUE bit (2) is rotated in. The process is carried out 8 times for each byte, and then that byte is sent to the printer via OSWRCH (equivalent of VDU1,byte).

I have departed from my usual style of short, comprehensible sub-routines for this dump, as there are clear advantages in having the code fit into a single page of memory (ie, within 256 bytes). Furthermore the calling of sub-routines – even in assembly language using jsr – is relatively slow, and this printer is not the most rapid, and so it needs all the help we can give it.

The program is written so that it auto-saves the machine code under the name CANONPJ, which can thereafter be *RUN (from tape) or run via *CANONPJ from disc. It saves in the unused cassette buffer if you are using disc, and in page 13 (&D00) if you are using tape. These can be adjusted simply at your own need.

The dump includes a jump instruction at its start. It may be re-operated after initial *LOADing or *RUNning by the statement CALL&A00 (disc version) or CALL&D00 (tape version).

Mode 1

logical colour	physical colour
0	0
1	1
2	3
3	7

Table 1.

SOFTWARE INVASION...

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3D BOMB ALLEY

... the continued thunder of the hissing ground missiles had long now deafened him - unless he had some of those bombers down, the fleet, in the small stretch of water was a sitting duck... 3D ACTION, SOUND EFFECTS, BEAUTIFUL GRAPHICS BBC MODEL B £7.95 CASSETTE £11.95 DISK



ATTACK ON ALPHA CENTAURI

... he punched the key, and the control monitor filled with the picture of bug-eyed wasps attacking from their volcanic nest; decisively he dived to the left and his laser gun burst into action... 3D ACTION, EXPLOSIVE SOUND EFFECTS BBC MODEL B £7.95 CASSETTE £11.95 DISK



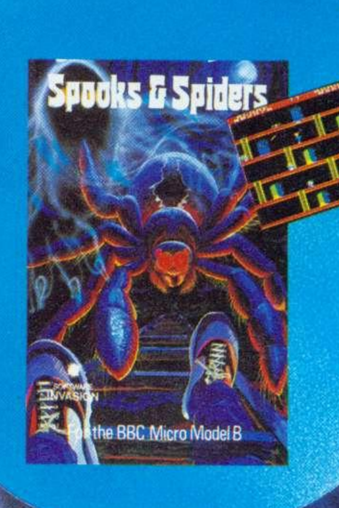
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. . . perhaps, very slowly, he could reach the cellar – quietly he started climbing down, his foot slipped as the giant spider dived towards him . . .
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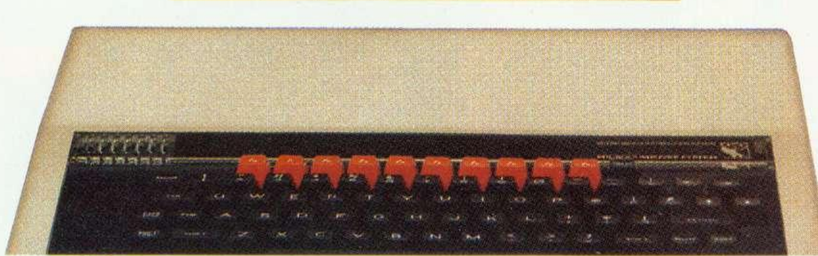
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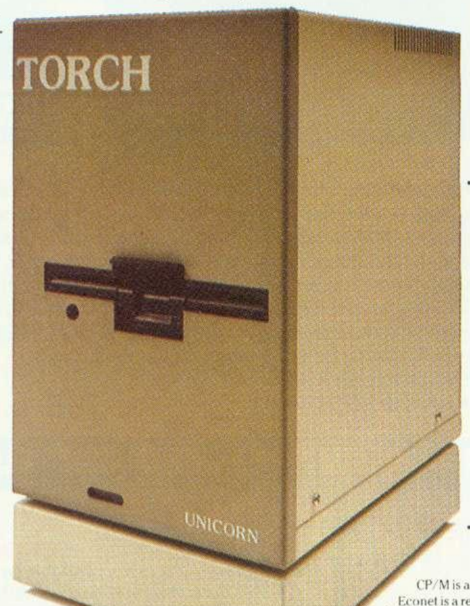
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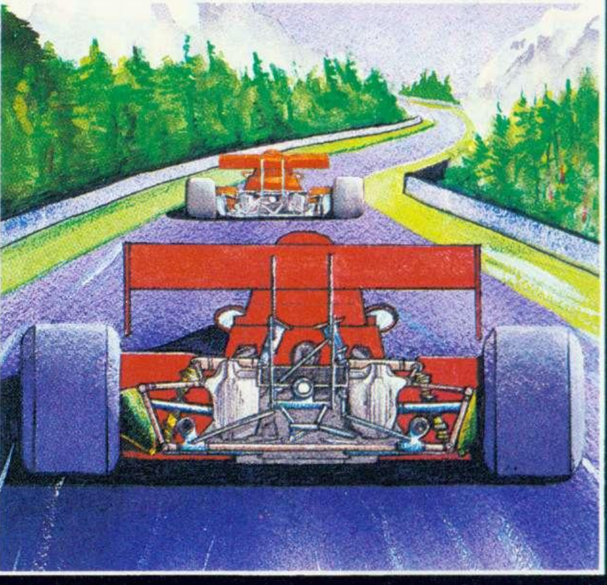












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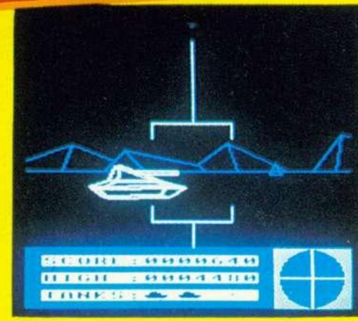
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Superior Mover moves programs like Hunchback, Roadrunner, etc to disk, £5. Nutcrackers Tape 2 Tape+ Tape 2 Disk+ Disc 2 Tape+ Disc 2 Disc (will handle locked files), £5. Super disk menu, £5. R-Soft, 22 Marriotts Close, Felmersham, MK43 7HD, Beds. Tel: (0234) 781730.

Graphics Utilities. *GSAVE saves mode, palette, & screen to disk in compacted form. *GLOAD reloads screen in approximately 2 seconds. Ideal for computer slide shows, education, games etc. 40/80 track (state which), £9.50. J. D. Watson, 84 Albert Road, Caversham, Reading RG4 7PL. Tel: (0734) 470588.

Simcon Tank level controller simulation with colour-mimic for dynamic modelling. Ideal training aid. Cassette £25. Details: Scitech Software, P.O. Box 6, West Kilbride, Ayrshire, KA23 9HY.

Globe-Test world geography quiz for BBC B: Countries, capitals, rivers, deserts, mountain ranges, oceans, seas. Stunning graphics. Cassette £7, disk £9. Newbytes, 3 Hickory Drive, Harestock, Winchester SO22 6NJ.

Printers for BBC. RS232 interface. 180 CPS. Bidirectional printing. Dot matrix 7×9. True descenders. Buffered. Various baud rates. Variable traktor settings, ideal for users requiring fast continuous printing. £80. Tel: Crowthorne (0344) 776894.

BBC micros inoperable without your password. Embedded, encrypted I.C. revealing proof of ownership on request, OS1.00 onwards. Send name, address, password, 12 characters maximum, £18. M. Gillett, 135 Honey Lane, Waltham Abbey, Essex.

User Guide binders. Stiff plastic backed 16-ring titled open flat binders. £3.50 inc p & p. Hepworth, Waulkmill Farm, Ingersley Vale, Bollington, Macclesfield, Cheshire SK10 5BP.

Data Crunch, suite of programs for common parametric, non-parametric and regression statistics, £12 each. SAE, OUS Software, Wayside House, Letchworth Lane, Letchworth, Herts. (BBC 32k).

Copyking – Supreme tape copier. Copies almost anything. Locks/unlocks. Up to ten programs repeatedly saved. Full length, disguised load address and headers catered for. BBC B+OS1.2. £3.50. T. Thornham, 6 The Meadows, Walberton, W. Sussex BN18 0PB.

Multiple choice question program, BBC tape, disc, Electron. Permits more than one correct answer, space for explanation, hard copy etc. Tape £8.50, disc £10.50. Details: Moreton, 91 Umberslade Road, Birmingham B29 7SB.

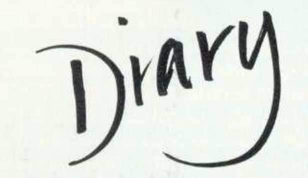
Epson (FX)/View wordprocessor printer driver. Extensive use of printer facilities including: elite, italics, proportional character spacing, etc. 40-track disc, only £7.50 including documentation. Rose Gardens, Penstraze, Chacewater, Truro, Cornwall TR4 8PN.

BBC keypad. Speed up data entry with 25-key add-on. Eliminates shift for + * = etc. £50 total. SAE for details: Extron, 16 Priory Park, Bradford-on-Avon, Wiltshire BA15 1QU.

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ACORN ABUSER'S



Unmasked: magman they couldn't gag

CURIOUSER and curiouser. Derek Meakin, the 'head of National Micro Centres', as he is proclaimed from his own press release, has spoken out against Mastertronic for slashing the price of its games software to £1.99.

Funny, says we, haven't we heard the name Derek Meakin somewhere else? And his address in St Petersgate, Manchester: isn't that also familiar? Ah, yes, that's the address of Optima Software. That must be why it's familiar.

But what about the phone number given for information, 061-456 8383? Try ringing that and you get Database Publications! Could it be that some user magazines are not as independent as they claim?

Torch in opposition

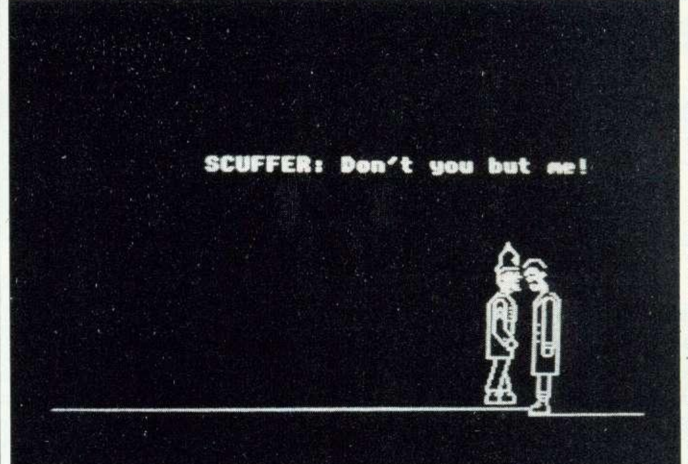
SSSSH! Don't tell the Tories . . . but Labour leader Neil Kinnock has gone and got himself a Torch.

Trouble is we can't throw much more light on this particular Torch because they are all so *fwightfully* busy round at the Leader of the Opposition's offices.

The chap in charge of the machine is one Charles Clarke, but when tackled about the Torch he was in far too much of a flap to talk about it.

Asked what they were going to use it for, all Mr Clarke had time to gasp was: 'Awfully busy right now. Can you call later . . . in about a month's time!' Some comedian.

However, the Curse of the Acorn Abuser struck the next day: a wordprocessed press release from the office went out with the last paragraph missing!



Coming clean. . .

REMEMBER 'Yossa' and 'Bones' – the two clean programs on the naughty Sicsoft disc which was mentioned last month? Well, someone has owned up to them. It's MRM Software up in Grimsby with a skeleton in the cupboard and, by an amazing coincidence, their ad was facing the Diary page on which we revealed the existence of the blue disc. However, a high-ranking spokesman for MRM denied that they'd written the other programs.

Bad call

JEREMY Ruston, who's having legal wrangles with Acorn over his latest book which pulls apart the Basic ROM, recently discovered just how good Acorn's communications are. A surprise telephone call from a programmer at Acorn's American operation who was trying to write a spreadsheet interrupted his scribing. It turned out that the only source of advice on the Basic ROM the American could find was – you guessed it – Jeremy. Having a book banned isn't the end of the world after all.

Quite Likely

AS PART of its rapid growth programme which has already taken in Torch and Torus, Acorn is soon to announce the takeover of an even larger and more established Cambridge-based company.

Dr Alex Reid, director of company purchasing, commented: 'I cannot yet reveal who it is, but we have sent off the cheque and we have been promised 28-day delivery with a free gift if they are late.'

Pornographics

A NEW company is being set up to publish the growing range of black market pornographic programs. Acornhard will only sell through high street 'adult' stores and selected bent dealers.

Wildcards

SECURITY-minded bods at Cherry Hinton have installed a cardkey doorlock system for Acorn's new high-tech R&D building.

Mastermind of the operation was Andrew Mackintosh, formerly head of Lisa development at Apple and now Acorn's head of advanced R&D.

Claimed Andrew: 'The idea of the system is not to stop journalists creeping in at the dead of night to see our top-secret 68032 second processors. It was installed to prevent some of our hairy hardware engineers getting out.'

Bitter blow

ANONYMOUS letter from Acorn's Cherry Hinton HQ concerning June's issue to our Ed:

Dear Tony Quinn,
What's with the Freudian slips!! ZX80 indeed! You won't live that one down in a hurry.
Serves you right!
Yours in a huff.

Only comment from Ed: 'What a load of wind.'

Quote quota

ACORN has hit out at magazines that publish anonymous comments as official policy. In a sharply worded statement a spokesman said 'The magazines are killing the goose that lays the silver lining.'

He also claimed that rumours of marketing man Tom Hummingbird's replacement by a third generation android were 'utterly groundless. I'm as fifth generation as Tony Quill. Oops! Don't quote me on that.'

Qwerty is three months old and still having his cliche procedures debugged.

Spy network

ACORN has won the Queen's Award for Industrial Espionage. This follows the demonstration of breaking all A&F's protection systems and having copies of their games on Econet within minutes of the originals arriving.

JARGON JUNGLE

N FINCH of Chingford thought we might like to see this Buzzword Generator (right), which he came across on a computer course. 'It is used to demonstrate how jargon can look impressive but not actually mean anything,' he says. This piece, which earns Mr Finch a fiver, took minutes to compose:

'The integrated management capability leads the way for a systematic and responsive supervisory contingency with a view to increasing the inter-active transitional software design. This in turn will have a parallel in the compatibility of third-generation real-time programming.'

BUZZWORD GENERATOR

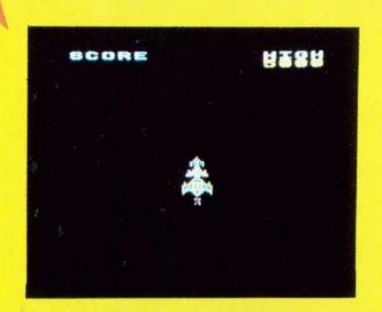
	1	2	3
1	integrated	management	options
2	systematic	organisational	mobility
3	total	monitored	flexibility
4	parallel	reciprocal	capability
5	balanced	policy	contingency
6	compatible	third-generation	projection
7	synchronised	incremental	hardware
8	optional	transitional	time-phase
9	responsive	logic	concept
10	functional	digital	programming
11	favourable	supervisory	design
12	authentic	real-time	software
13	inter-active	marginal	profitability
14	situational	appointed	facilities

Use a word from each column to make a useless but interesting 'add-to-senten

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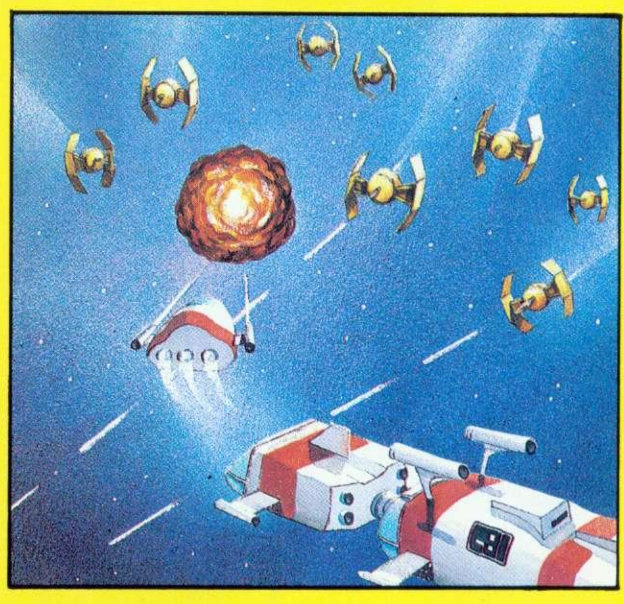








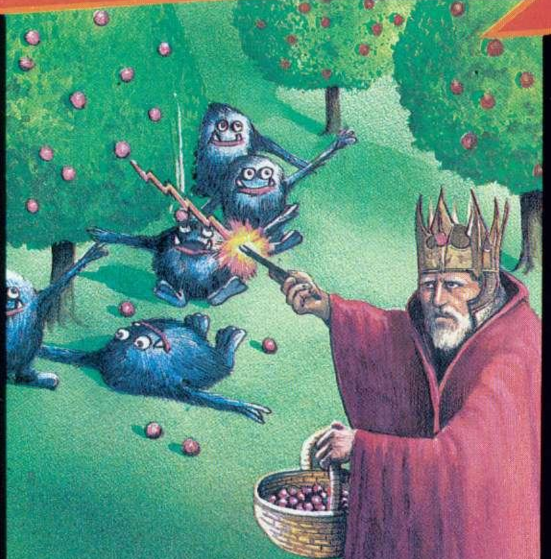




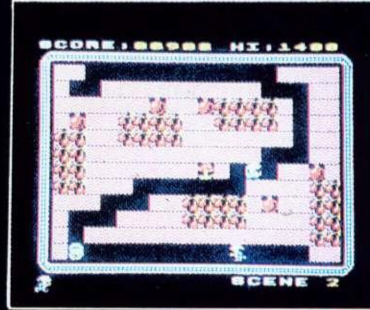
STAR STRIKER (32K) £7.95

A multi-stage arcade-style game in which you take control of a 3-stage rocket equipped with 4 side lasers and a central laser cannon. Not only must you defend the rocket against the 6 types of circling alien, and avoid the asteroids and fireballs, but you must also attempt to dock the separate stages of the rocket together. Stunning graphics, sound effects, introductory tunes, hi-score and rankings. Another excellent program from Superior Software.
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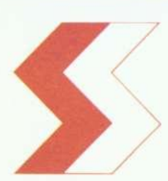




MR. WIZ (32K) £7.95

From the author of Percy Penguin, Mr. Wiz is a fast-action multi-scene game. Guide Mr. Wiz around the garden to eat the cherries whilst avoiding the evil gremlins. The gremlins can be killed by dropping apples on them or by throwing the crystal ball. Extra points can be gained by eating the magic mushroom, but beware . . . this is the home of the gremlins and makes them permanently furious! Sound effects and tunes, hi-score, rankings. Superb arcade-style action.
(KEYBOARDS or JOYSTICKS).

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